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A Consolidation of Engineering News, Engineering Record, The Sanitary Engineer, and The Contractor

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 103 NEW YORK, DECEMBER 26, 1929 Number 26

Business and Prudence

AS THE end of the year approaches it is proper to look back at the twelvemonth with its remarkable business phenomena and its lessons in practical economics. It is two months since the great stock-market inflation ended in a collapse, and industry is moving along on an even keel. There is high satisfaction in the healthy, substantial character of the country's activity, shown by its resistance to being disturbed by the deflation, and shown again by the excellent reports of coming construction which *Engineering News-Record* presented three weeks ago. The useful lesson has been learned, also, that the stability of the general construction field bears little relation to the speculative stock fluctuations; the course of production and consumption held steady in accord with the course of general construction. These points aside, one strong teaching of the inflation and deflation is that stability and soundness still depends and probably always will depend on reasonable prudence—for example, on not expanding unduly fast, and on maintaining a safe reserve of working capital in the face of temptations to risk all on the turn of a card. Business is sufficiently conscious of this need, we believe, to proceed constructively during the coming twelvemonth.

As to Some Controversies

ONE other matter is worth thinking about in this connection. Though there are many large problems and approaching controversies to keep the business mind stirred up, it is not likely that they will be unduly disturbing. Matters such as disputes over railroad valuation, consolidation, utility regulation and finance, for example, could easily cause unsettlement under the conditions of some years ago. Today they are approached in a more temperate attitude. Men of differing convictions are more inclined to understand the other's viewpoint and to recognize the opposing sides of the question, and business has learned that being predatory is not its big objective. Court decisions, the functioning of regulatory commissions, and growing recognition of the importance of sound public relations have contributed to this result, though some of the credit must go to the basic appreciation of economic facts gained by the people at large during the war period ten years ago. Whatever the causes, it is plain that the public mind works more deliberately and has more faith in the view that improper advantages are unlikely to be maintained lastingly. This state of mind has measurably grown in strength, and with the coming of a new year it betters the prospect of sustained business equanimity and health.

Steel and Cement

THE contemplated acquisition of the Atlas Portland Cement Company by the United States Steel Corporation is the most sensational development in the field of civil engineering industry for a long time. Not only does it mark a more decided participation of the latter corporation in the extraneous industry of cement production—it has long owned the Universal Portland Cement Company—but it creates a unit interest in the cement field so large as to exert perhaps a dominating interest on conditions in that field. Cement has not been in an altogether happy state in the last year or two; the margin of productive capacity over market requirements has become large and competition over-keen, so much so as to allow views on suitable quality to become badly unsettled under the influence of the production of numerous real and putative high-early-strength cements. The change in ownership, if consummated, may bring about greater technological co-operation and better adjustment of production. Price and market questions aside, there is urgent need for a fuller and more open discussion of pending questions as to current qualities of cement than has yet been achieved. It will be distinctly to the interest of user as well as producer if the ownership change in question leads to this result.

Death on the Highway

FATALITIES due to motor-vehicle accidents in the United States will reach a record total of 30,000 for 1929, according to the National Safety Council. This is 7 per cent over the 27,500 of 1928. Further comparison with figures of previous years indicates that the accident rate is increasing faster than our population or motor-vehicle registration. Congestion and saturation of our highways is evidently a prime factor in the cause of motor accidents today. The tendency is to place the blame of road accidents on the driver, where undoubtedly much of it belongs, but it cannot be denied that some of the blame is attributable to imperfections in the highway structure itself. Soft and narrow shoulders, narrow culverts and bridges, slick-surfaced slabs and unmarked danger points are producing a steady succession of serious accidents. Grade crossings with other highways and with railways add their share. It is to the credit of our highway and public officials that these menaces are being eliminated as rapidly as is physically and financially possible, yet progress should be many times faster. Though much has been written and done about highway safety, engineers must redouble their efforts to build safety into our roads.

Teeth for Building Codes

TECHNICAL committees appointed to make suggestions for redrafting the building code of New York City are making a determined effort to secure the inclusion of effective enforcement provisions. No less important are the innovations and improvements suggested for technical clauses of the code, but it is somewhat premature to discuss these. Furthermore, regardless of technical merit, a building code is of little use unless structures

are built in compliance with its mandates. The New York committees propose, first, that plans submitted to the building department be accompanied by an affidavit, signed by the engineer and the architect, to the effect that the plans conform to the code in every particular. More important, the committees also propose that before a certificate of occupancy is granted an additional signed affidavit be filed stating that the structure actually was built in complete accord with the file plans. Provisions of more far-reaching and salutary effect could not have been proposed. They were, indeed, suggested three years ago by a joint committee of architects and engineers on structural safety. Enforcement of existing building codes rests upon exercise of the police power. Requiring the engineer, the architect, and if need be the owner, to sign affidavits of compliance will support this enforcement mechanism by the professional conscience of the best and ablest citizens. Not only should it receive thoughtful consideration, but everyone interested in the welfare of the building industry should assure himself that these provisions are incorporated in New York City's new code. They constitute the most promising suggestion for putting teeth into building code enforcement that has been brought forward in many years. They must not be lost in the shuffle of drafting a code from the committee reports that have been made.

Time for New Garments?

AN OLD and respected name may soon be erased from the profession's vocabulary. "Member of the American Society of Civil Engineers" has been an honorable badge since the young days of civil engineering on this side of the water, and it remains as solidly honorable today. But the spirit of innovation comes along, and finds fault with the ancient title—that it is not expressive of a grade distinction, that it does injustice to the "Associate Member," who also is a member in the usual meaning of the latter word, and so forth. Therefore, innovation proposes the title "Fellow" to replace "Member." There may be merit in the purpose to remove ambiguity concerning the status of the associate member, but there is some obvious lack of merit in appropriating the academic terminology of secluded scientific organizations to the service of the working engineer. For years the engineer has striven consistently to make himself part of the warp and woof of industry and the world's business, to stand distinct from the craftsman and from the votaries of pure science; if that endeavor should suffer through the assumption of scientific dress it would be a real loss. Wherever the balance may lie, many of us will regret the passing of a time-honored name, a name which civil engineering wore with pride during a splendid period of progress. And if innovation shall win the day, let it be hoped at least that the profession will yet remain inspired by the ideal of practical utilization of physical knowledge to the world's needs. If it is time to cast away old garments and take on new, let the man within remain unchanged.

Important Column Data

INVESTIGATION of column strength occupies so distinguished a position in the records of structural study that the recent tests of the Port of New York Authority are the more notable and important. First, they cover a field as yet unexplored, for such large sections have not previously been tested, surely not in as large a group or in such an instructive range of materials. Our largest testing machine was none too large, and in fact lacked sufficient capacity to permit measuring the strength of equivalent columns incased in concrete—such as the columns of the Hudson River bridge with their proposed incasement. As it is, the incasement tests which formed a later part of the program had to be limited to columns of smaller dimensions, making a comparison with the unincased tests less satisfactory. Second, the present tests show once again that column strength is measured rather closely by the yield strength of the material, and that therefore a steel of high compressive yield point is most efficient for the purpose. Third, they bring out in gratifying manner the success achieved by the engineers in eliminating detail weakness and obtaining integral column action. That this success was approximated but not fully achieved, as shown by the observations of local buckling in some of the columns, merely confirms the belief that existing rules of best practice in this respect are very near the mark. But it is also a reminder of the fact that columns can hardly be made too sturdy, and that the designer of columns ought always make it his aim to design for the greatest attainable sturdiness. A few per cent of length-ratio sacrificed, in exchange for greater solidity of section, is a profitable investment.

Obsolescence of Buildings

THAT structural depreciation is but a small factor in limiting the life of office buildings and that the major factors are primarily obsolescence and secondarily depreciation of minor parts and general equipment are outstanding points made evident by the fate of the Tacoma Building, in Chicago. The report on it indorses the findings of earlier reports on the Woman's Temple, published in *Engineering News-Record* of July 28, 1927, p. 136. These two buildings were 40 and 35 years old, respectively, when they were pulled down to make room for new structures intended to command higher rentals.

It has been assumed sometimes that 50 years is an average useful life for buildings of this class. But both of these structures, and they are examples of many others, were obsolete in design within 30 years. As structures able to carry loads and to provide ordinary facilities for tenants, the old buildings were practically as good as when new. But as revenue-earning or dividend-paying structures they were obsolete. The interior arrangement, the plumbing, the elevators and mechanical equipment were hopelessly out of date. Maintenance was minimized in order to reduce operating expenses, but the unfavorable and unattractive conditions were thus increased. Vigorous combating of such neglect and incipient dilapidation might remedy conditions temporarily. But real modernization, even if practicable, would probably involve prohibitive expense in most cases. And even if the class of occupancy remained the same, the revamped building would still be outclassed by more modern structures. The only remedy is the radical one of pulling down the old building and erecting a modern one in its place. Furthermore, modern tenants are more and more exacting as to conveniences and facilities.

What of the new buildings of today, many of them designed as monuments for perpetuity? What will be their conditions as to service and occupancy by 1960? In the report on the Woman's Temple it was said: "Some of the basic principles of construction have changed in the relatively short period between 1892 and the present

time [1926]. We have no assurance or reason to feel that these principles will not improve again in the coming 35 years of office-building construction." One change has already developed, and that is the use of the private automobile, so that some buildings are designed to afford garage space and facilities for some of their tenants.

Further change is looming in the use of private airships. Commercial or general aircraft may use regular airports, as railway trains use union stations. But it is conceivable that the desire of owners of private vessels may wish to go direct to their destination as they do—or did—in automobiles. Landing facilities on tall buildings may then be a feature in future developments and may in turn influence mechanical equipment by requiring ample elevator service to the roof as well as influencing architectural design by the necessity of avoiding towers and pinnacles. These are but indications of changes which may develop in the next few years and may result in the obsolescence of buildings still structurally sound.

Terminal Costs and Values

THE tracks which for years have occupied much of the surface of important avenues on the west side of Manhattan Island at last are to be removed. Years of negotiating between the New York Central Railroad Company and the city of New York over the details of how they were to be taken off the streets ended in an agreement last July. Now the Interstate Commerce Commission has approved and work is to be begun.

The railroad company's West Side tracks which are to be taken off the streets extend from 60th St. to Canal St., a distance of 4½ miles. New right-of-way, elevated and depressed track construction, yard and street changes, and electric power supply and equipment will bring the cost of the proposed changes up to about $139,000,000, a figure which at first glance seems to be beyond reason. But when it is realized that the West Side line is the only freight line on Manhattan Island, the great value of its strategic position may better be realized. Also, no small portion of this vast expenditure is for land for right-of-way, much of which can be used for warehouse and other auxiliary purposes. Judging by the way in which air-right values have multiplied in the Grand Central zone in New York since that terminal was rebuilt and electrified, the income from land and air-right rentals may offset much of the cost.

As for the city, the benefits which it will receive in the restoration of streets to full vehicular use and from appreciation of land values will far exceed the $18,000,000 which it must expend as its part of the cost of the work. As Commissioner Eastman said in comment upon the project when it was before the Interstate Commerce Commission, it would appear to be a case in which a much greater portion of the cost should be borne by the city in view of the benefits it is to receive. But snap judgments in such cases are to be avoided. The same view might have been taken of the investment in the Grand Central Terminal reconstruction, an enormous expenditure for its day; and yet at this moment the railroad company is tearing down costly buildings which it erected over its tracks at that time in order to lease their site at a rental far beyond the most optimistic estimates of that earlier day. Our whole conception of what constitutes reasonable costs for terminal developments appears due for a great change. Thinking needs to be based upon present prospects rather than past conditions.

Chicago's Problem

THE famous Chicago lake diversion case nears its end. The special master, in the program he has set up to carry out the Supreme Court's decision, has in effect found against the Sanitary District, and save for the final action of the court in confirming or modifying his recommendations the litigation is over.

Mr. Hughes adheres closely to the principles stated by the Supreme Court in its fundamental decision of last January. He sweeps aside most of the district's plea for permanent allowance of a relatively large diversion and a long period of grace. Without going so far as the complainants asked, he limits the ultimate diversion to 1,500 sec.-ft. and allows nine years as the time for reaching this limit. In substance he ignores the question of how the city's water supply is to be made safe; that is the city's own affair. But he does propose that control works be built in the river which Chicago uses as main sewer, to prevent pollution of the lake by its inflow under storm conditions.

The finding means that nine years are to bring to completion by far the largest sewage-treatment construction the world has yet known. Stupendous though the task may be, it can be achieved if the district rises to the occasion. Physically and technically it is readily possible. Financially it is well within the capacity of a city of several millions. The real task—and it is one of tremendous magnitude—is governmental reform and businesslike administration.

A rising of the business men and citizenship of Chicago to set up honest and efficient government is the supreme necessity. City, county and sanitary district have for months been partly paralyzed, as the effect of deeply intrenched corruption and inefficiency. Their situation is without parallel in the history of cities. Taxation is in a muddle. Salary payments have been delayed and were finally made possible only by special bank loans, which cannot go on much longer. Bond issues or doubling of taxes are required to meet city expenses, past and to come. The voters, for years liberal in authorizing bond issues, have taken to voting down proposed bonds because of lack of confidence in their governing bodies.

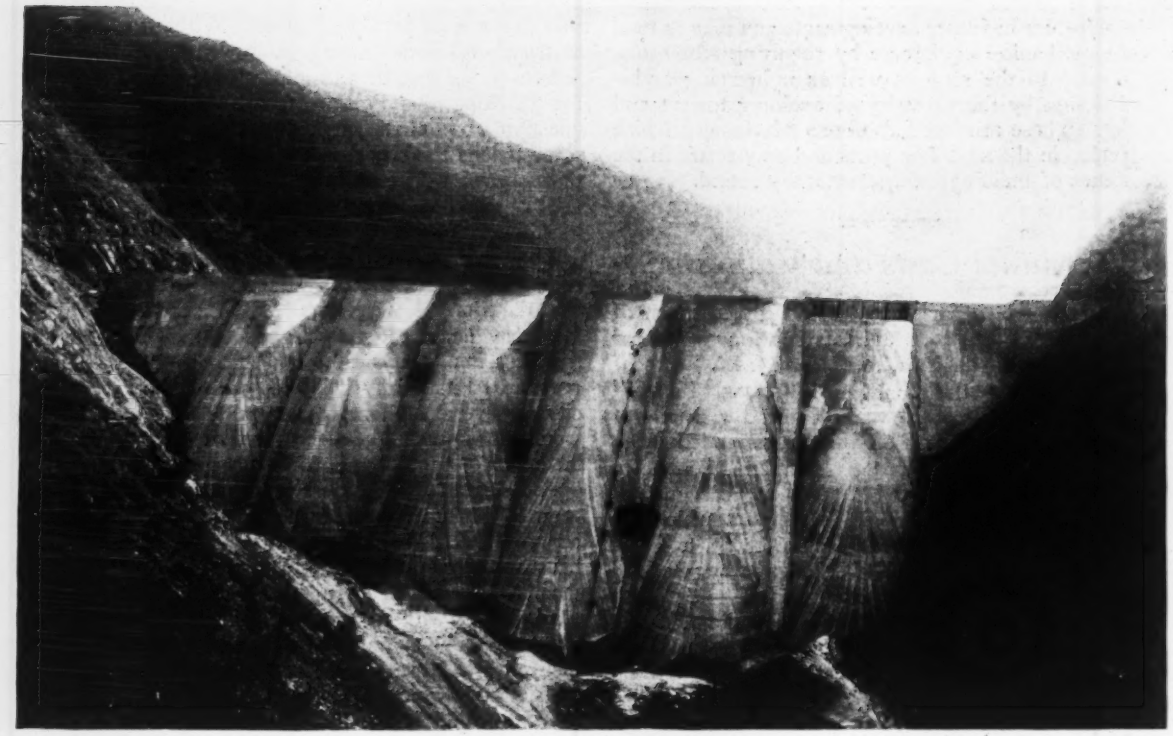
In the face of such conditions, which are only too well known, the sole hope for the sanitary district under the demands put upon it by the Hughes program is for engineers, business men and financiers of the city and district to take the matter into their own hands—to plan the reforms and administrative steps, to marshal the voters to their support, and to supervise the execution of the work. This will require courage and self-sacrifice, but the time has come for strong action. Business, in these days a close partner in municipal affairs, must now take up the burden with determination.

We speak of the fundamental element of the situation which Chicago now faces, rather than the specific problems of sewage treatment or the effect of the decree upon the city's sanitation, because quite obviously the former is crucial. Under the conditions now existing there can be no adequate sewage-works construction or safeguarding of water, or progress toward readiness for the day of reckoning. New and sound conditions must be created. The engineering and construction work, as already said, presents no insuperable difficulties. The real problem is one of the will to do—honestly, competently and with the expedition demanded by compelling physical necessity.

Design and Construction of Big Dalton Multiple-Arch Dam

High Double-Wall Buttress Structure Built With Gravity Abutments by Los Angeles Flood-Control District

By E. C. Eaton
Chief Engineer, Los Angeles Flood-Control District



UPSTREAM FACE OF BIG DALTON DAM
Spillway at crest of right-hand arch necessitated by steep canyon sides. Note gravity abutments.

COMPLETION of the Big Dalton dam last August adds the eleventh unit to the flood-control and water-conservation program of the Los Angeles Flood-Control District. Features of this multiple-arch structure, 180 ft. high, are the foundation problems encountered that necessitated a change in design and the weakened planes that were provided in the buttresses parallel to the line of principal stress to control the location of possible cracks. Reinforcing was unusually heavy, amounting to 44.57 lb. per cubic yard of concrete in the arches and 29.34 lb. per cubic yard of concrete in the buttresses, and although the dam has not yet been subjected to full-load pressure, temperature changes have occurred of from 30 to 100 deg. without any evidence of cracking appearing in the members.

The dam is located on Big Dalton wash, about 30 miles east of Los Angeles, above extensive orange groves that previously had been menaced by brief but devastating floods. In addition to providing flood protection to this district, the 1,280 acre-ft. of capacity of the reservoir also will be used to conserve the floodwaters. The stored water will be released gradually to replenish ground-water storage that has become seriously depleted owing to extensive pumping for irrigation.

A rockfill dam, about 150 ft. high, was first planned for this location, and work was started in December, 1925. A concrete toe wall was constructed and a rock quarry was opened. The rockfill material developed was disappointing as to quality; inspection showed about 50 per cent of the quarry product would have to be rejected, with consequent heavy increase in the cost of the portion used. Lack of suitable rock at a reasonable price and abutment conditions that indicated the amounts of overburden to be removed would be excessive caused abandonment of the plan. After further exploration the site was moved 400 ft. upstream, where better rock conditions permitted economic design of a concrete structure. The multiple-arch type was selected as most suited to this new site, and the concrete toe wall previously constructed for the rockfill dam will be used to provide a stilling pool for the spillway and pipe outlets.

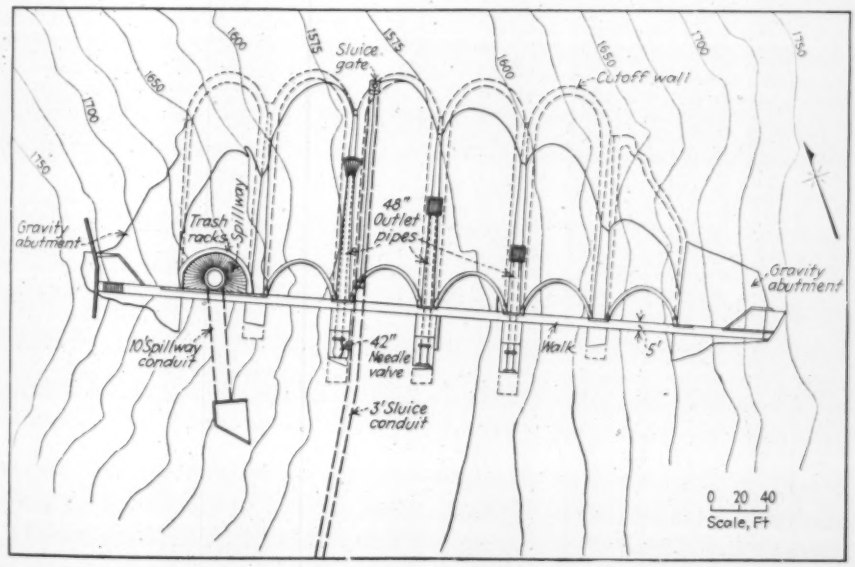
A report on the geology of the new site, prepared by Prof. A. C. Lawson, University of California, states that the foundation rock is a dark-grained diorite, traversed occasionally by dikes of light-colored alaskite. The site was thoroughly explored by means of fourteen test pits and tunnels to determine the extent of the alaskite material, and the result showed that satisfactory foundations could be found.

Design—The dam is of multiple-arch type with six

VIEW DOWNSTREAM DURING CONSTRUCTION
Narrow canyon permitted pouring from single 240-ft. tower.

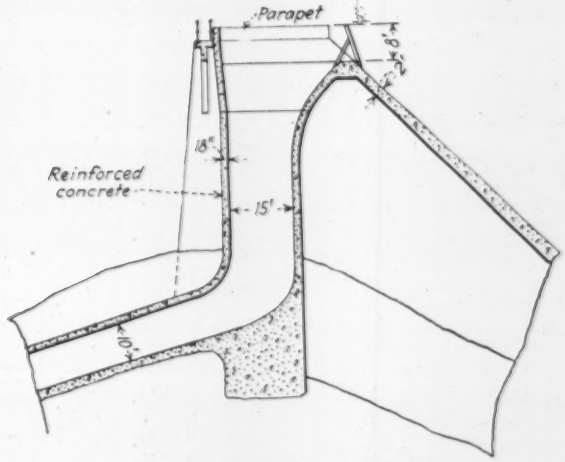
arches supported by double wall buttresses, the highest one being 145 ft. above streambed and 180 ft. above lowest foundation. The slope of the arch crown is 9 horizontal to 10 vertical and the thickness of the highest arch varies from 5 ft. at the base to 2 ft. at the top. Buttresses are 60 ft. center to center, and the highest buttress has walls 4 ft. 3 in. thick at ground level separated by a 5-ft. 6-in. space. This buttress section gradually changes to a 2-ft. wall thickness and a 10-ft. space near the top, as shown in the accompanying drawing. Below ground level the buttresses are solid and extend to spread footings; the elevation and width of the footings were determined by the engineer in the field.

Vertical stiffener walls, provided between the two buttress walls, are 1 ft. 6 in. thick spaced at 30-ft. intervals, and a concrete slab 2 ft. thick closes the downstream end of the buttresses and provides additional stiffness. Each buttress may be considered to act as a series of H-section columns with a column ratio for the highest buttress of about 14 to 165, or approximately 1 to 12. No horizontal struts are necessary therefore between the buttresses.



PLAN OF DAM SHOWING TOPOGRAPHY OF SITE

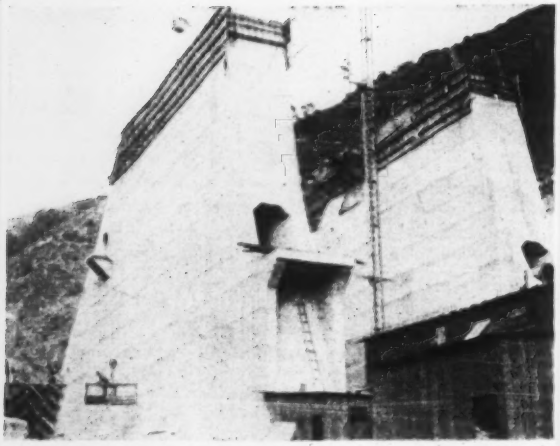
The two main limitations in the design were a maximum foundation pressure of 150 lb. per sq.in. and a minimum concrete thickness of 24 in. The arches were designed by two methods: that of Hool and Johnson was used for the lowest critical arch only and the method developed by F. A. Noetzli ("Improved Type of Multiple-Arch Dam," *Trans.* Am.Soc.C.E., 1924) was used for the general arch design. The latter method gives results for multiple-arch dams almost identical with the Cain method. Maximum compressive stresses in the arch due to combined water pressure and rib shortening are approximately 570 lb. per sq.in. at the intrados of



SECTION THROUGH SPILLWAY

the lowest arch. Load conditions as indicated by the design do not produce tension in the arches.

The theory of stresses indicates clearly that in multiple-arch dams the water pressure is transmitted to the foundation in an inclined direction so that the buttress may be considered a series of inclined columns. The writer has supervised and reported upon several dams of this general type and has not encountered one without cracks in the buttresses. For this reason in the design of the Big Dalton dam particular attention was paid to the reinforcing, and in addition two contraction joints were provided in each buttress parallel to the direction of principal stress. These joints are planes of weakness formed by inserting elastic filler one-third of the way through the buttress wall from each side along the line of principal stress. Thus, if the shrinkage or other tension stresses are not sufficient to form a crack, the solid third section will carry the small stresses normal to the joint. On the other hand, cracks in the buttress will be localized in the contraction joint and will extend in a direction that will not cause weakness in the buttress. The main reinforcing steel is stopped at this joint and short splice bars are provided that will permit small displacements of the joint, as shown in the



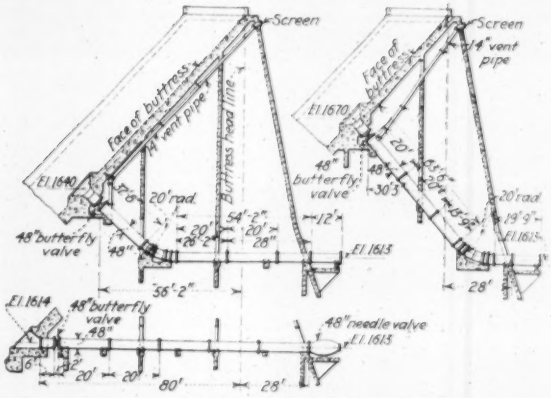
DOUBLE-WALL BUTTRESSES FROM DOWNSTREAM SIDE BEFORE ARCHES WERE POURED

accompanying detail. Reinforcing steel in the completed structure totaled 680 tons.

Gravity Section Abutments—The original plan called for the usual construction, with arches terminating in cutoff trenches at the hillside abutments. However, depth of overburden on the sides of the canyon and the steepness of the walls combined to make this plan impracticable. Removal of loose overburden at the abutments for depths of 50 to 80 ft. undercut the sides of the canyon above the contemplated crest of the dam, producing some slides and threatening more serious ones. In addition, difficulty was encountered in avoiding the alaskite material where the east abutment would take the arch thrust, and these difficulties resulted in a change of design and the substitution of gravity abutments for the arch rings at each end. These gravity abutments are 5 ft. wide at the crest and have slopes that correspond to the up- and down-stream slopes of the buttresses shown in the accompanying section.

Foundation work began in December, 1927, and following the failure of the St. Francis dam the next spring, work was interrupted for five weeks to permit additional foundation examinations along the buttresses. Three 6x6-ft. test pits were sunk at each buttress location to prove the availability of sound rock before continuing construction. Cutoff trenches at the bottom of the arches were carried 15 to 30 ft. into sound bedrock below the elevation of the buttress foundations. Grout holes at 5-ft. intervals were drilled in the bottom of the cutoff trench 50 ft. deep and grouted with neat cement at a pressure of 125 lb. Quantities of grout forced into the foundation rock were very small; the maximum amount taken at any hole was fourteen sacks. Concrete in the cutoff trenches was poured directly against the rock walls without formwork.

Construction—The contractor's construction plant included bunkers for aggregate with a capacity of 350 cu.yd. and equipment for proportioning the coarse material by volume and the sand in inundators. Aggregate was delivered to the site in three sizes, with a 2½-in. maximum, and was carefully proportioned to provide



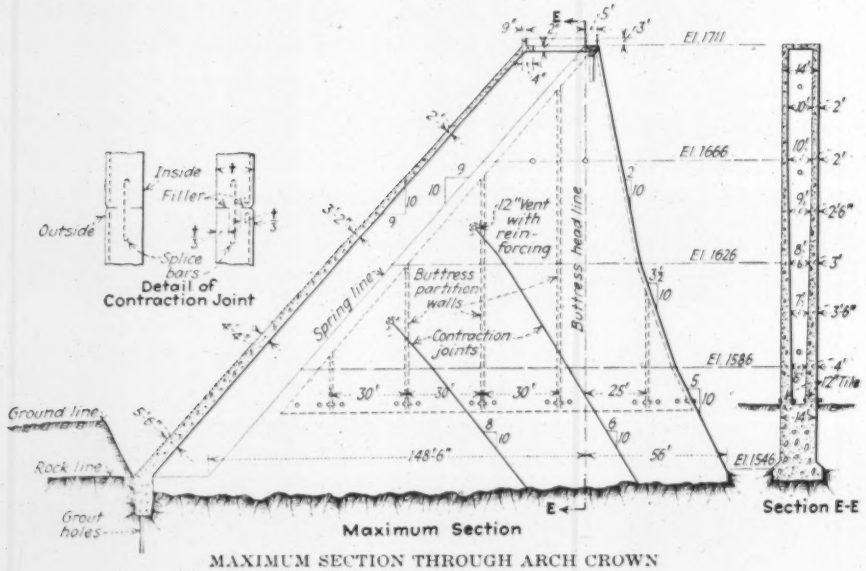
ARRANGEMENT OF OUTLET PIPES

The three outlet pipes discharge at the same elevations, but have inlets at different levels.

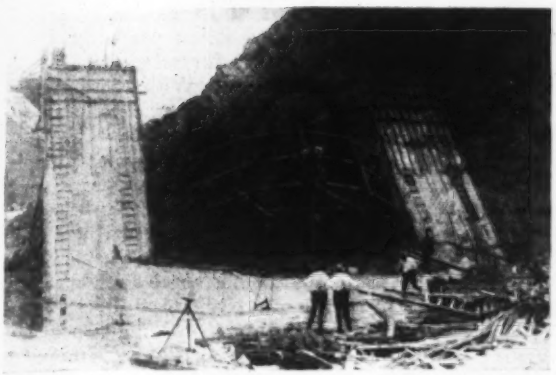
maximum density, strength and workability. A typical mix consisted of five sacks of cement, 14 cu.ft. of inundated sand, 15 cu.ft. medium aggregate and 15 cu.ft. of coarse aggregate. Cement content in the concrete of the arches was about 1.1 bbl. per cubic yard, and in the buttresses the cement averaged slightly over 1 bbl. per cubic yard of concrete. The maximum size of aggregate was limited to 2½ in. because of the thin sections and the heavy reinforcing.

The narrow canyon made it possible to pour almost all of the concrete from a single steel hoisting tower 240 ft. high. Steel centering was used to support the intrados arch forms and an excellent surface was obtained.

Determination of the effectiveness of the buttress reinforcement and the diagonal contraction joints was demonstrated by placing strain-gage lines across each diagonal contraction joint on both sides of one buttress to measure movement in the joint. The gage lines were installed after the joint had opened about 0.001 in. and the movement measured was exclusive of this initial amount. Measurement showed that the joint opened in cold



MAXIMUM SECTION THROUGH ARCH CROWN



ERECTING STEEL ARCH CENTERING
Buttresses are 60 ft. center to center.

weather and closed in warm; the largest movement measured was about 0.001 in. in addition to the original opening. This movement, had the joints been omitted, would have caused tensile stresses of about 100 lb. per sq.in. In addition to these measured movements, plaster of paris, placed over the contraction joints to indicate any inappreciable movement along these lines, developed hairline cracks. With the exception of this movement along the contraction joints, as provided for in the design, no cracks have developed, although the dam already has experienced temperatures varying from 30 to 100 deg. F.

Circular Spillway—Spillway provision, by means of the usual overflow section at one side of the dam, was impossible because of the steep sides of the canyon. The spillway was formed by discontinuing one of the side arches 8 ft. below top of parapet wall and providing an outlet through a vertical reinforced-concrete tube 15 ft. in diameter between two buttresses. The vertical section of this spillway outlet is about 39 ft. long and, reaching bedrock, turns downstream and continues as a conduit 10 ft. in diameter. This closed conduit terminates about 40 ft. below the downstream end of the buttresses and the spillway discharge is quieted in a stilling pool formed by the concrete toe wall previously referred to. Intake of the spillway is provided with trash racks, and the hydraulic design of the entrance to the shaft is improved by funnel-shaped construction. Capacity of the spillway is calculated at 5,300 sec.-ft.

Outlets through the dam consist of three 48-in. steel pipes, with inlets at different elevations, that extend from the upstream face between the buttress walls and terminate at the downstream face. The two higher outlets, used primarily for flood control, are kept open during floods, and at other times the discharge is regulated by hand-operated butterfly valves at the intake end. The lowest outlet, which will be used under flood conditions, is equipped with an emergency butterfly valve at the intake end and a 48-in. needle valve at the lower end. A sluiceway consisting of a 30-in. pipe controlled at the upper end by a 30x30-in. sluice gate, is located below the lowest outlet and will be used to keep the level of the débris below the needle valve.

Design and construction were under the general supervision of the writer as chief engineer for the district. Plans were prepared by S. M. Fisher, chief designer, and approved by F. A. Noetzli, consulting engineer for the district. Resident engineer was C. R. Metcalf, and concrete proportioning was controlled by the district's testing engineer, R. W. Carlson. The H. W. Rohl Company, of San Francisco, was the contractor.

Water-Works Improvements Reduce Costs at Evansville

Fuel Costs Are Cut Practically in Half and at the Same Time Reliability and Capacity Are Increased and Labor Costs Are Lowered

By H. F. Lutz
Of Black & Veatch, Consulting Engineers, Kansas City, Mo.

SUBSTANTIAL fuel savings to follow improvements in the water-works of Evansville, Ind., were predicted in an article in *Engineering News-Record*, Dec. 13, 1928, p. 880. The installation is not yet entirely complete, but fuel records to date indicate that all of the expected savings will be made and probably more. The accompanying diagram gives monthly fuel records since January, 1926, and shows 1.90 tons of coal required per million gallons of water pumped in September, as compared with much higher values in previous years. Further savings are expected after all equipment is in regular operation and tests have been made. The savings thus far shown are the result of a number of plant improvements which will be described in this article.

1. Until July 10, 1928, direct pressure was used. The pumping rate had to follow the rate of consumption and ranged from 5 to 18 m.g.d. It was necessary to operate two boilers to carry the hourly peaks on the system and to prevent a complete shutdown in case of trouble in the boiler room, such as tube failures. This caused very low ratings on the boilers during light-load periods, with a corresponding low efficiency. A new 20-m.g. storage reservoir on elevated ground has made it possible to pump at a practically constant rate with only one boiler in service at a high efficiency.

2. Forced-draft chain-grate stokers of a recent type have replaced the former natural-draft stokers which gave a low efficiency and trouble from clinkering.

3. New baffles were placed in the boilers which reduced the flue gas temperatures and raised the efficiency.

4. A zeolite water softener now treats the makeup water for boiler feed. Absence of scale deposits raises the boiler efficiency somewhat.

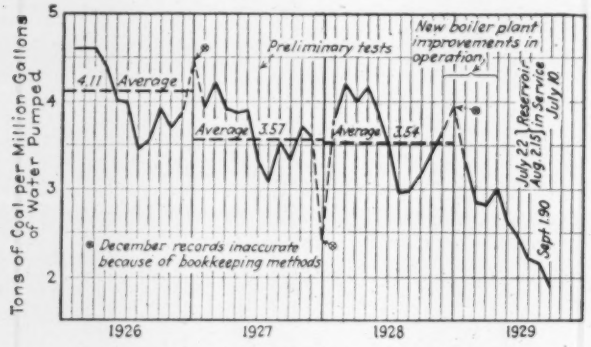
5. A CO_2 recorder, steam-flow meters and an improved type of automatic regulator enable the firemen to operate at a much higher boiler efficiency.

6. In July, 1927, while making the preliminary study for the proposed improvements, tests were run on one of the two 10-m.g.d. vertical triple-expansion pumping engines, installed in 1897. It was found that at half speed the duty averaged for two trials 56.4 million foot-pounds per 1,000 lb. of steam. At full speed, the average of two trials showed a duty of 67.5 million foot-pounds. The original guaranteed duty on these pumps was 145 million foot-pounds at full speed. Indicator cards showed that very little work was being done by the low-pressure cylinder, because of the very poor condition of the valves. One of the pumps has been thoroughly overhauled and the second pump is now being worked on. Tests have not yet been made on the reconditioned pump, but it is expected that the original guaranteed duty will be obtained. It is seen that the amount of steam required for high-service pumping should be cut in half.

7. Another saving is in the new scheme of wash-water pumping. The original layout of the plant included two steam-driven centrifugal wash-water pumps. These units were not entirely satisfactory and later the

wash water was drawn directly from the high-pressure main. The new improvements include a hydraulic turbine-driven wash-water pump. The hydraulic turbine uses 1,500 gal. per minute from the high-pressure main and discharges this water into the wash-water line. The turbine is direct connected to a centrifugal wash-water pump which pumps approximately 1,500 g.p.m. from the clear well to the wash-water line, giving a total flow of 3,000 g.p.m. This arrangement gives the same amount of wash water at half the fuel cost and with half the required high-service pump capacity.

A labor saving is being made in the coal- and ash-handling system. Formerly it was necessary to shovel all coal from the incoming motor truck to the storage bin and from the storage bin to the stoker hoppers. It was also necessary to shovel the ashes from the ashpits to wheelbarrows and from the ashpile to the outgoing motor truck. In the new system the incoming truck will dump coal into an underground hopper with a reciprocating-plate feeder which feeds the coal to a pivoted bucket



FUEL RECORDS AT EVANSVILLE PUMPING PLANT BEFORE AND AFTER IMPROVEMENTS

conveyor. The coal is deposited in a 100-ton overhead steel bunker with a traveling weigh larry beneath. A crusher is installed for handling lump coal if necessary. The ash is raked from the new stoker hoppers to the same conveyor and is carried to an overhead ash bin. The ash will be drawn off through valves directly to the outgoing trucks. Incidentally the amounts of coal and ash to be handled will be very materially reduced.

The operation of the two 10-m.g.d. high-service triple expansion pumping engines deserves special comment. These engines operated almost uninterruptedly from 1897 to 1929, or approximately 32 years. After their reconditioning they should be practically as good as new and there is no good reason why they should not run another 32 years. Specialists in machinery depreciation should take note of this remarkable operating record. These pumps will be used for regular service for many years to come. The fact that increasing consumption has not made them too small is due largely to the changing of the system from direct pressure to a reservoir system. This eliminates the necessity for pumping at the rate of maximum demand. A new 20-m.g.d. high-service steam turbine-driven centrifugal pump is being installed, but will be used only at times of unusual demand. The guaranteed duty of this new pump is 139 million foot-pounds per 1,000 lb. of steam as compared to 145 million for the old units. The reason for selecting the steam turbine-driven unit instead of a triple-expansion engine was that its cost was only about 40 per cent as great.

Improvements have been made in triple-expansion pumping engines since 1897, the greatest of which is probably the use of higher steam pressures and superheat. Because of the low fuel cost at Evansville, it was not considered economical to raise steam pressures at this time on account of the necessity for scrapping so much of the present usable equipment. With these existing steam conditions the old pumps are practically as economical as new ones would be if built today.

A change is being made in the low-service pumping equipment which lifts the water from the Ohio River to the filter plant. This pumping has formerly been done by two 15-m.g.d. steam turbine-driven centrifugal units. It was impossible to increase the capacity of this old installation in the present available space without undue congestion. It proved more economical to substitute electrically driven pumps rather than build a new low-service pit and a new intake system. Three new pumps of 8-, 12- and 20-m.g.d. capacities are being installed. The 8- and 12-m.g.d. pumps can be replaced by larger units when the demand makes it necessary. A generating plant is being built at ground level to furnish electrical energy to the low-service pumps and plant auxiliaries. Formerly it was necessary to operate a small non-condensing generating unit for furnishing energy to plant auxiliaries. In the new system this unit will be eliminated and the current taken from the new generating plant. Combining these two prime movers will about offset the losses in generator and motor on the low-service system. No change in fuel consumption for this equipment is anticipated.

The entire improvement which is now nearing completion was estimated at $1,195,000. Actual costs are running slightly under the original estimate. The system, when it is completed, will be much improved as regards safety, capacity, adequacy of service and lowering of operating costs.

The board of trustees of the Evansville Water-Works Department are Edward Heberer, chairman, Carl Bruner and Fred Baker. Charles Anderson is superintendent. Black & Veatch, consulting engineers, Kansas City, Mo., designed the new improvements. P. A. Diehl is resident engineer in charge of the new construction for Black & Veatch. Mr. Baker was on the board in 1897 when the original station was constructed.

Army Engineers to Build Hydraulic Laboratory at Memphis

Plans for the hydraulic laboratory of the Mississippi River Commission at Memphis, Tenn., call for an initial building 125 ft. long and 15 ft. wide with space reserved at one end for offices and workshop. Ultimately an additional length of 225 ft. will be made available. As stated by Lieut. H. A. Vogel in *The Echo*, bulletin of the Memphis Engineer District, the new laboratory will be for practical work pertaining to the alluvial valley of the Mississippi and its tributaries. Water will be taken from the river to a storage basin, whence it will be forced to a high constant-head reservoir serving the models by gravity flow. A service pipe arrangement utilizing the principle of individual constant-head tanks for each model will provide extreme accuracy of measurement. Used water will be returned to the pump well by way of a sand catcher. Lieutenant Vogel made an inspection of the various hydraulic laboratories of the country before starting the one at Memphis. For some time previously to reporting to the Memphis district he was engaged in studying hydraulics and hydraulic laboratories in Germany.

Tests of Large-Size Columns of Three Grades of Structural Steel

Half-Size Sections From Hudson River and Kill van Kull Bridges Give Important Data on Carbon, Silicon and Carbon-Manganese Steels—Extend Knowledge of Wide Plates Under Compression

By R. S. Johnston
Engineer of Research and Tests, Port of New York Authority

THE bridge department of the Port of New York Authority has been making a series of experimental studies and investigations on the physical properties of some of the materials to be used in the construction of the Hudson River suspension bridge and the Kill van Kull arch bridge and upon the strength of important fabricated parts of these bridges in order to check computed design strengths. The following preliminary report is given on one of the investigations dealing with the strength of large-size column sections.

Eight column sections containing 144 sq.in. or more of metal, of three different grades of structural steel, have been tested in the 10,000,000-lb. testing machine at the U. S. Bureau of Standards in Washington. Six of these columns were dimensionally one-half size specimens of the base columns of the towers of the Hudson River bridge. The remaining two sections were similarly proportioned models of a representative group of the lower chord sections of the Kill van Kull bridge. The Hudson River bridge tower column sections were fabricated in ordinary structural carbon steel, so-called structural silicon steel and a new grade of structural steel known as carbon-manganese. The Kill van Kull lower chord section was also of the carbon-manganese structural steel grade. The details of the column sections tested are shown in Fig. 1, and their geometrical properties are given in Table I.

The three grades of steel used were made to conform to the following specifications:

	Carbon Steel	Silicon Steel	C-Mn Steel
Tensile strength, lb./sq.in.	58,000–68,000	80,000–95,000	90,000 Min.
Yield point-min., lb./sq.in.	35,000	45,000*	55,000
Elongation in 8 in., min., per cent	1,500,000 (a)	1,500,000 (b)	1,500,000 (a)
	Ten. Str.	Ten. Str.	Ten. Str.
Reduction of area, min., per cent	42 (c)	30 (c)	30 (c)
Bend test, material ¾ in. or less	180 deg. D = 1T	180 deg. D = 1T	180 deg. D = 1T

*Each group of ten melts of silicon steel to be used in the towers which consecutively have met the individual minimum yield point requirement shall have a minimum average yield point of 47,000 lb. per sq.in.

(a) With reduction for increased thickness over ¾ in.
(b) With reduction for increased thickness over 1 in.
(c) With reduction for increased thickness over ¾ in.

According to the specifications, the carbon-manganese steel conformed to the following requirements as to chemical composition:

		Structural Steel	Rivets
Carbon	preferably not over	0.35	0.30
	maximum	0.40	0.35
Manganese, not over		1.80	1.80
Phosphorus	acid, not over	0.05	0.04
	basic, not over	0.04	0.04
Sulphur, not over		0.05	0.045
Silicon		10 to 30	10 to 30

An excess beyond the limits specified of more than 10 per cent for carbon and/or silicon content, 5 per cent for manganese and 25 per cent for phosphorus and sulphur is cause for rejection. The sum of the carbon and manganese content on check analyses should not exceed 2.05 per cent.

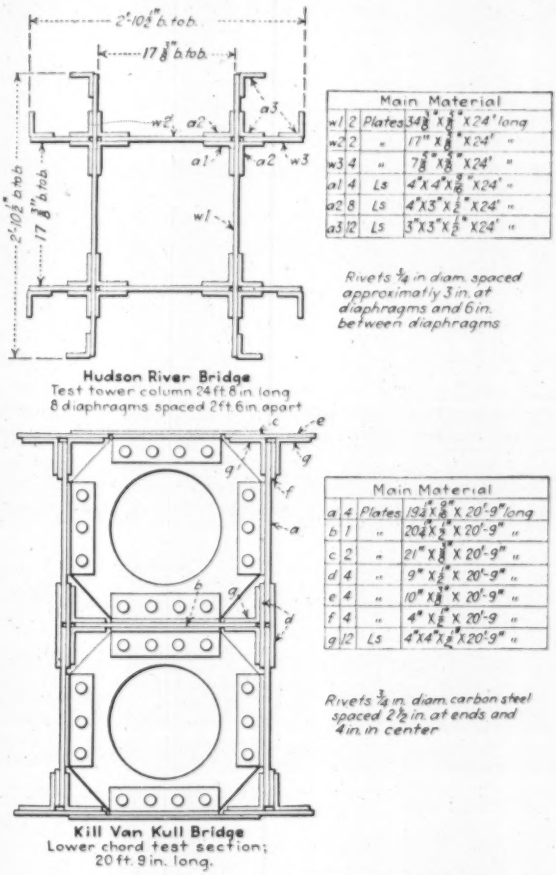

2'-10½" b. to b.
17⅞" b. to b.
Main Material
w1 2 Plates 34⅞" x ⅝" x 24' long
w2 2 " 17" x ⅝" x 24' "
w3 4 " 7⅞" x ⅝" x 24' "
a1 4 Ls 4" x 4" x ⅝" x 24' "
a2 8 Ls 4" x 3½" x ½" x 24' "
a3 12 Ls 3" x 3" x ½" x 24' "
Rivets ¾ in. diam. spaced approximately 3 in. at diaphragms and 6 in. between diaphragms
Hudson River Bridge
Test tower column 24 ft. 8 in. long
8 diaphragms spaced 2 ft. 6 in. apart
Main Material
a 4 Plates 19½" x ⅝" x 20'-9" long
b 1 " 20¼" x ½" x 20'-9" "
c 2 " 21" x ⅝" x 20'-9" "
d 4 " 9" x ½" x 20'-9" "
e 4 " 10" x ⅝" x 20'-9" "
f 4 " 4" x ½" x 20'-9" "
g 12 Ls 4" x 4" x ½" x 20'-9" "
Rivets ¾ in. diam. carbon steel spaced 2½ in. at ends and 4 in. in center
Kill Van Kull Bridge
Lower chord test section; 20 ft. 9 in. long.

FIG. 1—MAKE-UP OF TEST COLUMN SECTIONS

TABLE I—GEOMETRICAL PROPERTIES OF TEST COLUMNS

Test Col. No. (1)	Fabricated of (2)	Area, Sq.In. (3)	Length, Ft. (4)	Moment of Inertia, In.⁴ Ix-x (5)	Iy-y (6)	Radius of Gyration In. r (x-x) (7)	r (y-y) (8)	l/r x-x (9)	l/r y-y (10)	
V	Carbon steel	159	24 ft. 0 in.	15,794	15,794	9.97	9.97	28.9	28.9	Dimensionally one-half size of Hudson River bridge tower columns—Panel 0 ft. 1 in.
VI	Carbon steel	159	24 ft. 0 in.	15,794	15,794	9.97	9.97	28.9	28.9	
VII	Silicon steel	159	24 ft. 0 in.	15,794	15,794	9.97	9.97	28.9	28.9	
VIII	Silicon steel	159	24 ft. 0 in.	15,794	15,794	9.97	9.97	28.9	28.9	
1	C-Mn steel	155*	24 ft. 0 in.	14,995	14,995	9.97	9.97	28.9	28.9	
2	C-Mn steel	155*	24 ft. 0 in.	14,995	14,995	9.97	9.97	28.9	28.9	
1	C-Mn steel	144	20 ft. 9 in.	28,597	15,962	14.07	10.51	17.7	23.7	Dimensionally one half size of Kill van Kull bridge lower chord, sec. L-18-L19
2	C-Mn steel	144	20 ft. 9 in.	28,597	15,962	14.07	10.51	17.7	23.7	

*The main web plates in these columns were reduced from ½- to 9/16-in. thickness to keep the column section of higher strength steel wishin the testing machine capacity.

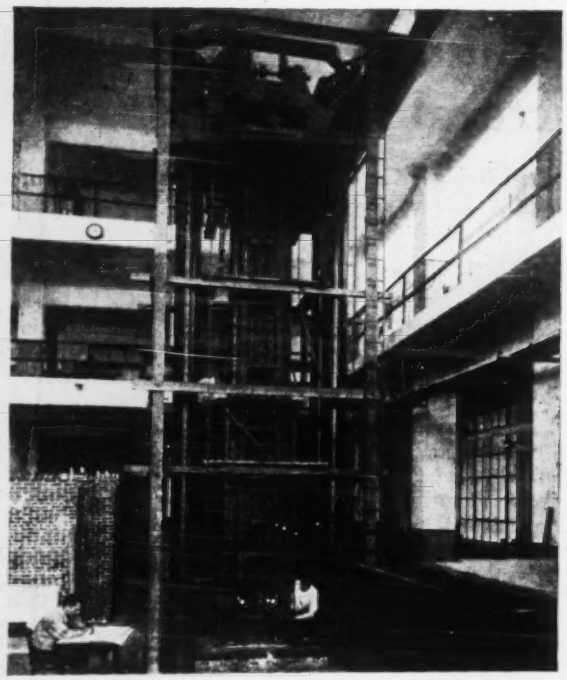


FIG. 2— SET-UP FOR TEST OF HUDSON RIVER BRIDGE TOWER-COLUMN TEST SECTION

Test Set-Ups—Test measurements consisted of the determination of the total compression in a fixed gage length (either 20 or 15 ft.), of the lateral deflection of the column, of the tendency, if such existed, of the column cross-section to change its geometrical shape under test; and a secondary study of stress distribution at various points of the geometrical section by the use of the telemeter.

The diaphragm construction of the Hudson River bridge column sections precluded the ordinary string and scale method for determining deflection. It was therefore necessary to erect a structural form around each column, to be used as the base line for determining deflection and any tendency toward geometrical distortion of the section during test. The general set-up for tests of the Hudson River bridge sections is shown in Fig. 2.

Total compression for the Hudson River bridge test columns was determined by a group of sixteen dial compressometers, of 20-ft. length, attached four to each column face, two on the edges of the outstanding flanges and two attached to the inner corner angles connecting the outstanding flanges to the webs forming the box section. The latter passed through the corner cut-outs of the exterior diaphragms. The compressometer arrangement is shown in Figs. 2 and 3.

The box girder section of the Kill van Kull bridge lower chord permitted the use of the general method for determining lateral deformation, and total compression was determined by a group of eight compressometers of 15-ft. length located two to a column face.

The columns were subjected to the increment method of loading—that is, with each additional increment of load the instrumental observations were made, until the total deformation resulting from the applied load deformed the member sufficiently to overrun the usefulness of the measuring instruments. Instrumental readings, therefore, were continued till the columns had about reached their maximum carrying capacity, after which

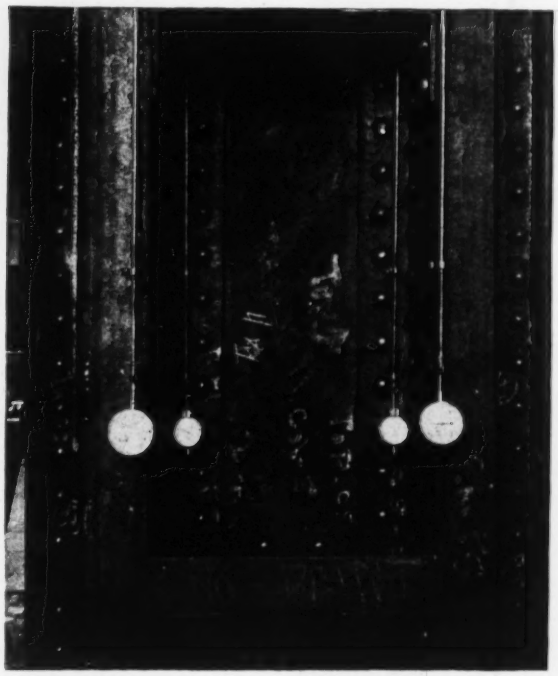


FIG. 3—COMPRESSOMETER LAYOUT FOR EACH FACE OF HUDSON RIVER BRIDGE TOWER-COLUMN TEST SECTION

TABLE II—SUMMARY OF LARGE-SIZE COLUMN TEST RESULTS

			Column Test Data—Stress at Failure			Yield Point of Column Section Determined From Mill Tests of Material				Test Column Efficiency,
						Average Y.P.		Weighted Y.P.		
Col. No.	Section	Type of Steel	P.L., Lb./Sq.In.	1st Max., Lb./Sq.In.	"Pick up" Max., Lb./Sq.In.	Max., Lb./Sq.In.	Min., Lb./Sq.In.	Max., Lb./Sq.In.	Min., Lb./Sq.In.	Per Cent
(1)	(2)	(3)	(4)*a*	(5)*b*	(6)*c*	(7)*d*	(8)*e*	(9)*f*	(10)*g*	(11)*h*
V	H.R.B.	Carbon	17,000	33,600	36,800	40,600	38,700	41,400	39,000	83.6
VI	H.R.B.	Carbon	18,000	33,500	36,700	40,600	38,700	41,400	39,000	83.3
VII	H.R.B.	Silicon	22,000	52,800	55,800	57,200	56,400	57,000	52,800	96.2
VIII	H.R.B.	Silicon	20,000	53,000	54,900	57,200	56,400	57,000	52,800	96.5
1	H.R.B.	C-Mn	24,000	61,560	.....	59,470	58,390	59,750	58,760	103.9
2	H.R.B.	C-Mn	22,000	62,280	.....	59,470	58,390	59,750	58,760	105.1
1	K.V.K.	C-Mn	24,000	59,000	.....	60,480	59,740	60,300	58,860	99.0
2	K.V.K.	C-Mn	23,000	58,650	.....	60,480	59,740	60,300	58,860	98.4

(*a*) The values for the proportional limit, P.L., in column 4 above were determined from the plotted test data showing the relation of applied stress to strain.

(*b*) The first maximum stress at failure, column 5 above, is the stress at which failure is ordinarily considered as occurring in column testing procedure.

(*c*) "Pick up" maximum stress, column 6 above, is the maximum stress taken by the test columns on long continued loading with considerable deformation after the column has taken its ordinary failing load, (first maximum). This phenomenon is not always exhibited by columns under test.

(*d*) Average Y.P. maximum, column 7 above, determined by averaging the *maximum* Y.P. values from coupon mill tests.

(*e*) Average Y.P. minimum, column 8 above, determined by averaging the *minimum* Y.P. values from coupon mill tests.

(*f*) Weighted Y.P. maximum, column 9 above, determined by weighting the *maximum* Y.P. values from coupon mill tests on the basis of the ratio of the area of section (plate or angle) represented by the mill test to the total test column area.

(*g*) Weighted Y.P. minimum, column 10 above, determined by weighting the *minimum* Y.P. values from the coupon mill tests on the basis of the ratio of the area of section (plate or angle) represented by the mill test to the total test column area.

(*h*) Test column efficiencies, column 11 above, are based on the mean of the weighted yield point values (9) and (10) and the first maximum stress at failure, (5), and they show ratio of column failing stress to mill tests of the material.

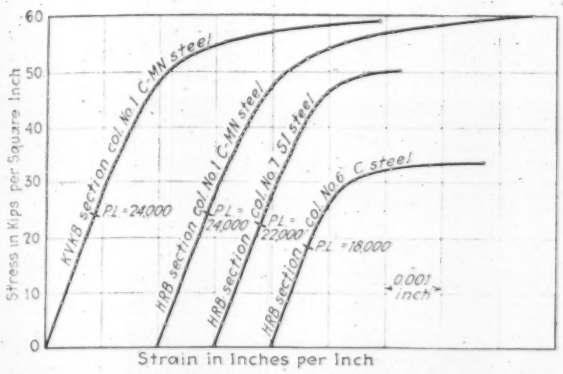


FIG. 4—STRESS-STRAIN CURVES OF LARGE-SIZE COLUMN TEST SECTIONS OF THREE GRADES OF STRUCTURAL STEEL

a series of load-time measurements was carried on to determine whether columns of this type would show the "pick up" phenomena that have sometimes been experienced in previous tests.

Test Results—The results of the tests are given in Table II and typical stress-strain curves in Fig. 4. The tests on the duplicate columns were so nearly identical that the curves in Fig. 4 may be considered as applying to either specimen of the group. In Table II the column strengths are compared with the strength of the material as determined from mill tests. Mill-test coupons were taken from each different thickness of angles and plates used in the fabrication of the test columns. The very high efficiencies of some of the columns may, therefore, be due to the fact that the mill tests did not truly represent the strength of the material. In developing the test program, provision was made to secure extra lengths of the material for a more careful determination of its properties, and the final report on these tests will be based on the additional information obtained from tests of this material.

On account of the large amount of labor necessary to reduce the observations taken in this series of tests, it is not possible at the present time to show deformation data. It is true, however, that the short l/r ratio of the columns and their box-section construction did not permit any marked deflections, until evidence had developed that the column was at the point of failure. Typical failures are shown in Fig. 5.

The following observations on the behavior of the test columns may be of interest:

In the Hudson River bridge tower column sections of plain carbon and silicon steel the webs forming the box core of the sections were of weaker material than that of the outstanding flange angles, judged by the results of the mill tests. The greatest difference occurred in the silicon steel columns. In test, the web plates developed Lüder-Hartmann lines first, showing that the low-strength webs were relieving load to the stronger outstanding flange angles. The excess strength in these flange angles kept them from exhibiting marked secondary flexure between diaphragms even with the lower-strength webs until the test column had nearly reached its ultimate strength.

The reverse condition was true for the carbon-man

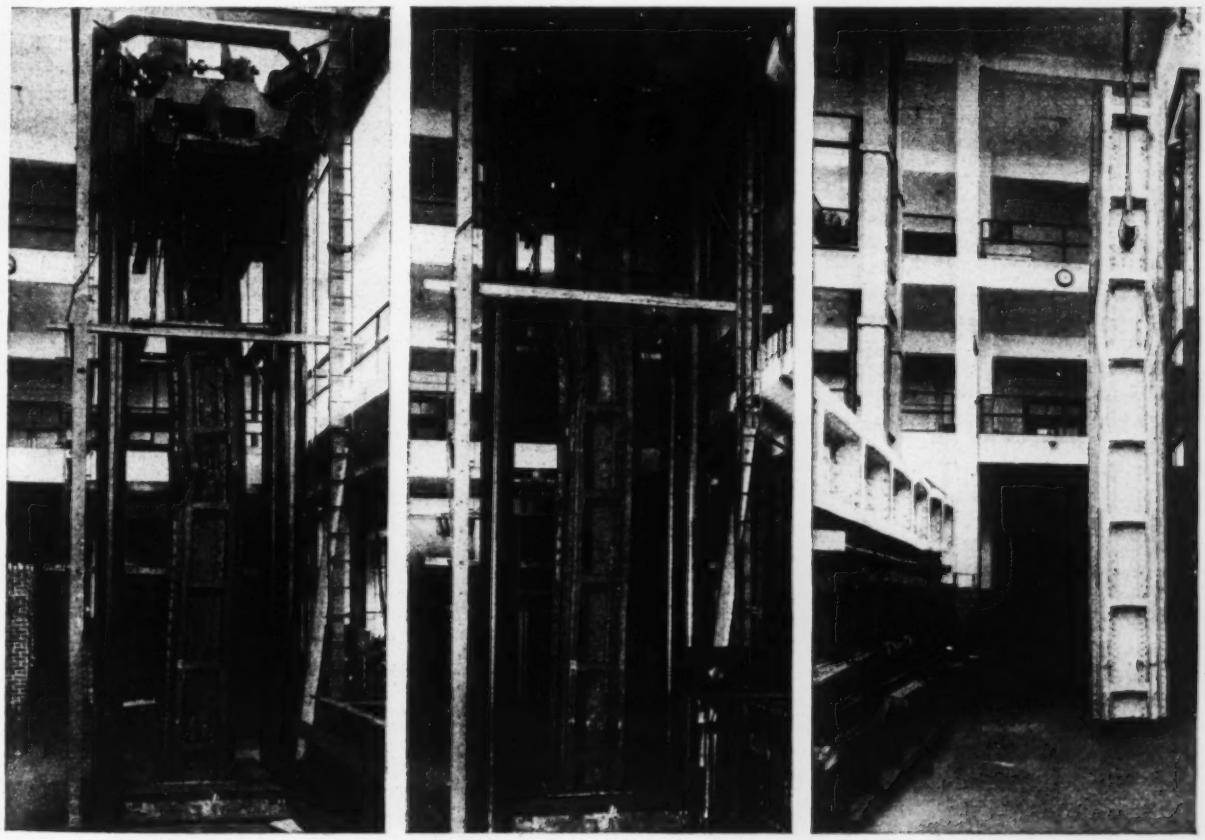


FIG. 5—TYPICAL FAILURES OF HUDSON RIVER BRIDGE TOWER-COLUMN TEST SECTIONS
Left, carbon steel column. Center, silicon steel column. Right, carbon-manganese steel column.

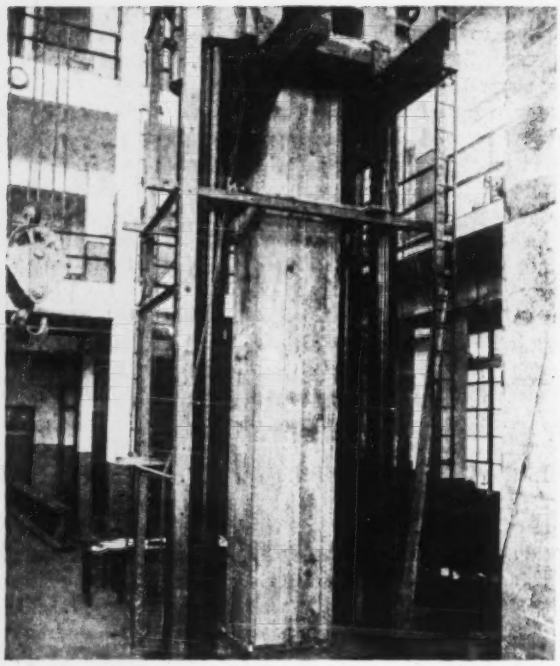


FIG. 6—TYPICAL FAILURE OF KILL VAN KULL LOWER CHORD TEST SECTION OF CARBON-MANGANESE STEEL

ganese steel columns of Hudson River bridge section. Under load, therefore, the outstanding flange angles of weaker material not only developed strain lines much earlier than did the webs (Fig. 7) but also exhibited more marked secondary flexure between diaphragms.

This peculiarity of behavior may partly account for the variation of column efficiencies given for the Hudson River bridge sections in Table II. With so large a proportion of the section as is represented by the webs, of low-strength material, it would appear that the column efficiency must be adversely affected. On the other hand, a preliminary failure of the outstanding flange angles, comprising a relatively small portion of the total area, probably would not seriously affect so rugged a center box section of high-strength steel.

Plate Width and Thickness—The Kill van Kull bridge lower chord section of carbon-manganese steel gave further interesting information concerning the compressive strength of wide web plates and the relations necessary between plate width and plate thickness. The cover plates of these sections developed a secondary buckling failure which may be seen in Figs. 6 and 8.

The dimensional relations of the cover plates to the flange angles and webs of the Kill van Kull bridge chord section, both for the actual bridge section and the test column section are shown in Fig. 9, with corresponding values for the ratio of cover plate width to thickness. The Port of New York Authority specifications for the design of the bridge contains the following provision: "Cover plates of built compression members . . . shall have a minimum thickness of one-fortieth . . . of the transverse distance between the lines of rivets connecting them to the flanges." This is the commonly accepted design stipulation for cover plates of compression members, the main web plates being held to the 1:30 ratio.

Reference to Fig. 9 shows that for the proposed bridge section the 1:40 ratio was slightly exceeded (1:41.6), but not by an amount that should cause questioning of the design. Likewise, it was not felt that the 1:4[illegible] ratio for the test column section was excessive for th[illegible] high-strength material used, especially as the ratio o[illegible] clear width to thickness was considerably lower and th[illegible] cover plate relatively thin. It was believed that th[illegible] clamping action of the riveting and the stiffness of th[illegible] flanges would tend to make the effective plate width of th[illegible] thin plate approach the clear width between flanges and assure against a secondary flexural failure of the plate. Yet in actual test the cover plates developed the secondary type of failure.

An examination of the first Kill van Kull bridge section tested indicated that the failure was due to the fact that the flange angles in themselves did not possess the rigidity necessary to furnish the fixed-ended support at the plate edges presupposed in the theory of elastic action upon which the ratio of plate width to thickness is based.

The Bryan formula suggested for use as a result of tests on the compressive strength of wide web plates made for the Delaware River Bridge Joint Commission indicates that the buckle length is equal to the effective plate width. Measurements of actual buckle lengths of the first column tested of the Kill van Kull bridge section gave an average buckle length of 19.68 in.—that is, almost the entire cover plate width—thus showing the lack of rigidity of support at the plate edges. This emphasizes the fact that an empirical rule such as the specification stipulation quoted above cannot be used blindly and that consideration must be given to type of fastening and relation of plate thickness to its supporting medium. It bears out the prior findings of the Delaware River Bridge Joint Commission tests, in which it was shown that for heavy web plates under compression it is necessary to assume full plate width rather than the distance between attaching rivet lines as a basis for determining a plate thickness secure against a secondary buckling failure.

Recognition of this condition from the first test of the Kill van Kull bridge sections led to an interesting check on the validity of the Bryan formula: $S = \frac{3.5Et^2}{b^2}$ in which S = stress at which buckling will occur, lb.

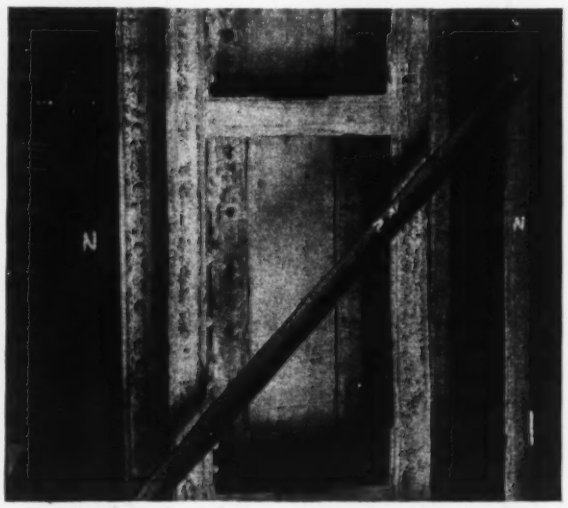


FIG. 7—LÜDER-HARTMANN LINES ON HUDSON RIVER BRIDGE COLUMN OF CARBON-MANGANESE STEEL
Note that all lines are concentrated on the flanges, which is in agreement with mill tests which showed webs to be of stronger material. Note also secondary buckling of flanges. Column is near ultimate load.

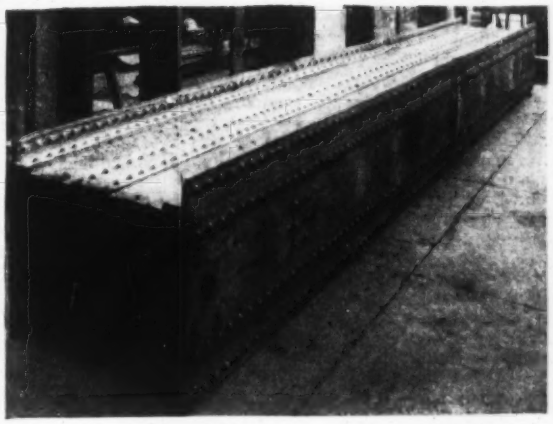


FIG. 8—SECONDARY BUCKLING FAILURE OF COVER PLATES, KILL VAN KULL LOWER CHORD TEST SECTION

per sq.in.; E = Young's modulus (assumed at 30,000,000 lb. per sq.in.; t = thickness of cover plate, in inches; and b = effective width of cover plate, in inches.

Substituting as the effective plate width in the formula the average buckle length as determined from the first test and the test column cover plate thickness, it was determined that the secondary buckling failure should begin to develop in the companion column while under test at a unit stress over the total column area of 38,000 lb. per sq.in. When this stress was reached during the test of the second column, it was questionable to the unaided eye whether buckling had occurred, but it was easy by means of a straight-edge to locate definitely the incipient buckling. Further loading of the column above the stress of 38,000 lb. per sq.in. verified the fact that the buckling of the plate was constantly increasing.

The tests of this investigation have been of decided value to the bridge department of the Port of New York Authority. They have vindicated the use of silicon steel and the box-section column for the tower columns of the Hudson River bridge, thus giving assurance of the strength of the bridge tower columns; and they have exhibited a weakness of detail design in some of the Kill van Kull lower chord sections which has permitted a redesign of these members so as to secure maximum efficiency from the section.

They are of further interest to the engineering profession in that they furnish data on the strengths of large fabricated columns and on the efficiency of specific types of section as compression members, give a direct comparison of three grades of structural steel from tests on identical sections, and furnish further critical information on conditions governing the security of wide plates under compression.

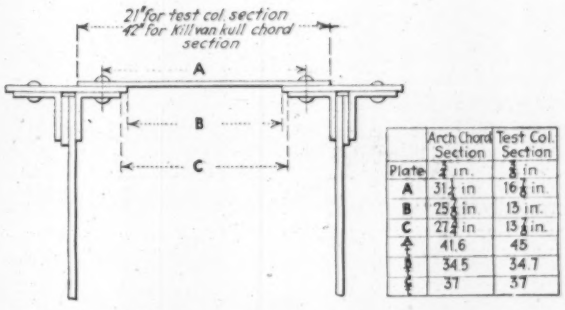


Plate	Arch Chord Section ⅜ in.	Test Col. Section ⅜ in.
A	31½ in.	16⅜ in.
B	25⅜ in.	13 in.
C	27½ in.	13⅜ in.
A/t	41.6	45
B/t	34.5	34.7
C/t	37	37

FIG. 9—RELATION OF WIDTH TO THICKNESS OF COVER PLATES, KILL VAN KULL LOWER CHORD AND TEST-COLUMN SECTION

The investigation was carried out under the supervision of O. H. Ammann, chief engineer of bridges, Port of New York Authority, and the writer, with the co-operation of the U. S. Bureau of Standards, with Dr. A. H. Stang of the bureau in charge of the tests.

Chicago Building Obsolescent After 40 Years

Skeleton Frame Tacoma Building Structurally Good but Out of Date in Design and Equipment—Condition Studied

DEPRECIATION and obsolescence conditions in an office building 40 years old were studied during the recent wrecking of the Tacoma Building, Chicago. This building, 101x177 ft., was thirteen stories in height. Plans were made in 1886-87 by Holabird & Roche (now Holabird & Root), architects, and the building was completed in May, 1889.

It was one of the first skeleton frame buildings, cast-iron columns and steel floor framing being used in its design. In the two street sides the frame consisted of cast-iron columns with cast-iron lintels supporting the brick and terra cotta walls, and it was the first building in which the walls were simply curtains, the masonry of each floor being supported independently. Rear walls, however, were of the masonry load-bearing type. There were also two load-bearing interior walls to provide wind-bracing, as the column connections were inadequate for this purpose, and these walls interfered rather seriously with the subdivision of the floor area. The foundations were of the spread type, each column and load-bearing wall having a concrete footing on the clay to support an I-beam grillage. It is stated that this was the first case in which I-beams instead of rails were used for the grillage in such foundations.

As to the floor framing, wrought iron was mentioned on the plans, but tests of the material removed indicate that steel was actually used. An analysis made by the Robert W. Hunt Company for the American Institute of Steel Construction gave the following results: carbon, 0.12 per cent; manganese, 0.40; phosphorus, 0.063; sulphur, 0.032 per cent. The report states: "The analysis indicates this material to be steel and not wrought iron. The manganese content is specially significant. An etching test further verifies this conclusion." A statement issued by the Institute says: "There has been no evidence of deterioration in the crystalline structure and the framework would have been good and efficient for many years. Original location markings in paint were as fresh and bright as when the beams were first covered. The material in the webs of the beams as originally rolled was less than ¼ in. in thickness, yet was still perfect and capable of carrying its loads when the sections were removed."

Both square and round columns were used, while at two interior points were rectangular columns having cored holes in the longer sides to reduce the weight. Column lengths were bolted together through flanges, while lugs were cast on the columns to support the lintels and I-beams. All riveting was done by hand, and rivet heads were neatly finished. Rivets were used to connect

steel to steel and bolts to connect steel to cast iron. Brick and tile cased the steel framework. With regard to the condition of the structure at the time of its removal, the following information is condensed from a report by Paul E. Holcomb, research engineer for the National Association of Building Owners and Managers:

Structural Depreciation—Practically no depreciation was found in any of the building framework, which was protected by fireproofing materials. In the top portion of the building some rust was discovered, due apparently to the access of moisture. In angles 2½x2½ in. supporting the booktile roof construction, there was an appreciable amount of scale, but corrosion was not sufficient to impair their strength. There was some rust deposit on beams and girders farther down, but the corrosion was very slight. In a $\frac{3}{8}$-in. steel rod adjacent to the terra cotta there was discoloration formed by corrosion, but no pitting. A rod extending from a column to the outside of a bay window showed no discoloration due to rust and apparently was in as good condition as when it was installed. Spreader pipes between adjacent members were sometimes rather badly scaled, but this did not affect the strength of the structure. The foundation grillage showed an appreciable amount of surface rusting, but the strength would not have been impaired for many years. Several of the spreader pipes were badly corroded and in some instances the wall of the pipe was eaten entirely through.

Lime mortar in the parapet wall had apparently rotted so that the bricks were easily removed. Mortar disintegration was found also at the terra cotta tile surrounding a column at the balcony of the thirteenth floor. In the jointing of the enameled brick of the light court it had been necessary to tuck point these bricks each year. Joints in the terra cotta facing also became loose and it was necessary to repoint them each year. However, there seemed little likelihood of brick or tile becoming loosened to the extent that it would cause a hazard to pedestrians. In the inside load-bearing wall the entire brickwork seemed solid and the mortar was bound so well to the brick that in some cases the brick broke rather than pulled away from the mortar. These facts seem to indicate that where no moisture could get into the mortar joint, a complete state of preservation existed, but that where the possibility of moisture was apparent the mortar had disintegrated to a considerable extent.

In a concrete slab taken from the grillage mat, the concrete had apparently disintegrated to such an extent that the only binder left at the edges of the mat was an asphalted compound which had apparently been used as a waterproofing. It was possible to pick the stone from the edge of this mat without difficulty, but this disintegration had not extended more than a few inches in from the edges of the slab. In the original rubble stone retaining walls under the sidewalks, both the stone and the mortar were in excellent condition. It is believed that waterproofing was used on the outside, as the wall appeared to be dry.

Other Depreciation—The original plumbing included brass waste pipe from the lavatories, connected with a wiped lead joint to a lead waste line connected to the waste stacks. Leakage at the joints and in the lead pipe caused the almost entire replacement of the plumbing waste line about twelve years ago. The risers and waste lines were made of wrought iron and there was very little noticeable corrosion. In the waste pipes, due either to the settling of the building or simply to the sagging of the risers, the calked joints were continually causing trouble by opening. These had the usual oakum and lead calking and the remedy was to install new lead and in some cases simply to peen over the previous calking.

There was considerable noticeable deterioration in the vent stacks above the roof line. In one steel stack, corrosion had extended more than 2 ft. below the top. Other vent stacks of wrought iron showed no appreciable corrosion or scale, although some discoloration by rusting was present. One notable instance of corrosion in the steel piping was the bleeder line to the elevator house tank, which line was located in the pipe shaft. This corrosion was on the outside of the pipe. Scale $\frac{1}{4}$ to $\frac{1}{2}$ in. thick extended the entire height of the building. It is thought that this corrosion was caused by the sweating of the pipe due to the fact that cold water was circulating continually through it. No pitting from the outside had occurred to such an extent that leakage had been caused. Presumably this installation occurred some years after the building was erected, as the pipe was of steel.

Corrosion of steelwork was noted in the fire escape. Possibly the most extensive deterioration noted in the building is the tank under the roof. The $\frac{1}{4}$-in. metal had corroded so that it was only $\frac{1}{32}$ in. thick over a large portion of the top. The scale inside was $\frac{3}{16}$ to $\frac{1}{4}$ in. thick, and on the top section the metal was entirely eaten through. This tank was of steel, and it is probable that the cause of corrosion was rainwater which had absorbed sulphur dioxide gas from the atmosphere and had formed a dilute solution of sulphuric acid. Another instance was the deterioration of the tin covering the steel framing of skylight over the twelfth floor toilet room. There had been a replacement of the entire skylight about twelve years ago, which indicates a short life. As the same corrosion had not been experienced on the skylight a few feet away, over the elevator machinery, it is thought probable that the fumes from the toilet room had caused some of this effect. Another cause was apparently the use of acids in cleaning the skylight periodically, which had later worked underneath the tin capping. The outside of the metal work was painted with an asphaltum paint, and there was no corrosion noted on the outside surface, but it had acted from beneath. Some of the sections of tin remaining had become so corroded that it was possible to break off pieces easily. The condition noted on these skylights offers a good illustration of the inadvisability of installing skylights, because of the constant high maintenance expense.

The window cleaners' safety bolts were lag screws simply screwed into the pine windowframe and offered very little resistance against pulling out. Within the past few years a constant replacement of bolts was carried on. Late in the life of the building the window cleaning company officials were hesitant about taking the contract, due to the hazards which were present for its men by reason of this design and condition of the belt safety bolts. Tar and gravel roofing was entirely disintegrated over a considerable portion of the attic penthouse roof. The corrosion had continued through the tin roofing beneath the tar and gravel and exposed the wooden sub-roof to the weather. Over a part of this area it was possible to see the light from below through the roof. Apparently this condition had been neglected because of the fact that this portion of the roof was not easily accessible and also because leakage at that point through the roof did not cause damage below on the thirteenth floor. Provision had been made for draining the leakage out through scuppers onto the main roof.

Depreciation—In summing up the depreciation factors of the Tacoma Building, it may be said that no depreciation was evident in the framing of the building, but that some of the masonry would have required expenditure to maintain it in proper condition. The exposed metal work showed the necessity for constant maintenance supervision to avoid the necessity for a large expenditure for rehabilitation. The early design of some of the equipment caused a greater depreciation factor, which led to a higher maintenance cost than might be encountered with present-day equipment. This applies especially to the plumbing fixtures and the mechanical power plant. However, there, too, was illustrated the necessity for constant supervision and prompt repair in order to avoid a large expense later in the life of the building.

Obsolescence—This is taken to mean the decrease in usefulness due to the causes other than physical wear. While the heavy masonry walls in the interior offered a considerable advantage in that the street frontages were made more usable, there was at the same time a sacrifice of flexibility of the interior space. It is estimated that an additional rental of $578 per floor per year could have been obtained if these interior walls had been of modern design and thickness. There were other features of the typical floor layout which worked to the disadvantage of the building. For example, in one interior office adjacent to the pipe shaft, the temperature in summer became almost unbearable due to insufficient insulation on the walls. Probably the most notable instance of obsolescence was the elevator equipment, with its small cars and low speed, so that continual complaints were made about the service.

It is apparent that from an economic standpoint part of the Tacoma Building and its equipment were unalterable. The elevator service, the renting barrier of the interior load-bearing walls and the general atmosphere of antiquity could not have been changed without great expense.

High-Voltage Submarine Cables Laid Under Delaware River

Current at the highest voltage ever used on submarine cables will be carried by eight single conductors recently laid between Deepwater Point, N. J., and Pigeon Point, Del., beneath the Delaware River. The distance between terminal structures is 3,521 ft. The eight cables will carry two three-phase 60,000-volt circuits, with a spare cable for each. Approximately 205,000 cu.yd. of material was excavated from the riverbed to form a trench with a minimum depth of 10 ft. and a bottom width of 40 ft. in which the cables are laid. To provide protection from ship anchors, approximately 100,000 cu.yd. of material will be backfilled in the trench.

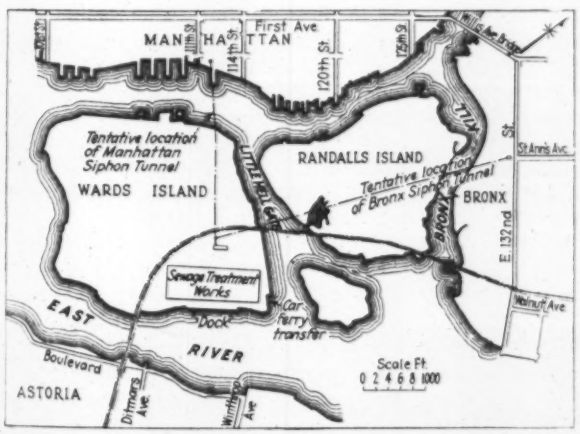
Proposed Activated-Sludge Plant for New York City

Parts of Manhattan and the Bronx With Estimated Population of 1,100,000 in 1930 to Be Served by 180,000,000-Gal.-Daily Plant of Diffused-Air Type at Cost of More Than $30,000,000, Including Tunnels

RECENT approval by the Board of Estimate and Apportionment of New York City of project plans for an activated-sludge plant with a dry-weather-flow capacity of 180,000,000 gal. daily (180 m.g.d.) puts that city in the lead of cities of the world that have yet built activated-sludge plants or adopted that process of sewage treatment. Preparation of contract plans for some portions of the plant is well along, in accordance with a program included in the contract between the city and Fuller & McClintock, consulting engineers, of New York City, for the design of the plant. (See *Engineering News-Record*, Dec. 6, 1928, p. 851.)

The plant is to be located on 52 acres of land on Wards Island, in the East River, as shown by the accompanying locality map. It will treat the sewage from 7,500 acres of land in the boroughs of Manhattan and the Bronx on which the estimated population in 1930 is 1,100,000, and in 1960 perhaps 1,500,000. The sewage to be treated in the new plant is now discharged into the East and Harlem rivers without treatment. Its interception and diversion to the sewage-works not only will stop pollution of the two rivers at the many points of outlet now in use but will also help clean up the entire harbor east and south of the city and also the Hudson River, all the surrounding waters being subject to backward and forward tidal flow.

Of the 180-m.g.d. total capacity of the plant, 111 m.g.d. is assigned to Manhattan and 69 m.g.d. to the Bronx. Although the plant is rated at 180 m.g.d., it is proposed to treat the dry-weather flow together with enough storm-flow to bring the total amount treated up to 360 m.g.d., but of the latter 90 m.g.d. will go through the preliminary settling tanks only. All the sewers in the tributary area are on the combined plan, but the sewage both now and in the future is assumed to be essentially domestic in character. The sewage flow is taken, on a per capita basis, at 146 gal. per day. Solid matters in the sewage



LOCALITY MAP OF WARDS ISLAND SEWAGE-WORKS AND SIPHON TUNNELS, NEW YORK CITY

are estimated to total 116 grams per capita per day, or 210 parts per million of suspended matter when the per capita flow is 146 gal. per day. This would equal 157.5 tons of dry solid matter per day from 180 m.g.d. of sewage, or 5,190 tons of wet sludge as removed from the settling tanks.

According to the project report submitted by George W. Fuller on behalf of Fuller & McClintock the projected activated-sludge plant "will produce a well-clarified effluent from which not less than 90 per cent of the total suspended matter, not less than 95 per cent of the total bacteria and from 85 to 90 per cent of the organic impurities are removed." The plant will be free from "nuisances due to obnoxious odors, gases and dusts." The 90 per cent removal of suspended solids may be compared, Mr. Fuller states, with 10 per cent removal by fine screens or 40 per cent removal by settling tanks alone.

Before the sewage enters the siphon tunnels leading to the sewage-works, it will pass through grit chambers and screens to remove "the coarser solids which might otherwise deposit in the tunnels." The siphon tunnels will be in rock, several hundred feet below the surface. At the Wards Island end of the tunnel there will be an uptake shaft which will deliver sewage at about 25 ft. below Manhattan datum. Up to this point all of the elements of design will be in the hands of the engineers of the two boroughs, but Fuller & McClintock, if requested, will co-operate in matters pertaining to the hydraulics of the sewage-works.

From a gate house above the uptake duplicate conduits will take sewage to the suction pipes of the main pumps, located some 45 ft. below the existing ground surface. There will be six main sewerage pumps in a deep pit, all motor-driven horizontal centrifugal: four of 105 and two of 70 m.g.d., making 560 m.g.d. total. The pumps will work against a total lift of about 51 ft.

The presedimentation tanks will be eight in number, each 98½ ft. square and 15 ft. deep, with a capacity of 1,100,000 gal. each; with one tank out of service there will be one hour displacement at the average rate of flow. The contract drawings will provide for bids on two types of apparatus to remove sludge from the presettling tanks. Grease and other floating matter will be removed from the surface of the sewage in these tanks by mechanically operated skimmers.

Reasons given in the report for the adoption of presedimentation tanks instead of fine screens are:

1. Settling tanks having one-hour detention period at average flow will reduce the volume and amount of sludge to be shipped to sea, as compared with a plant using fine screens, by several hundred tons per day. This is due to the fact that settling tanks will remove at least 30 per cent more of the total suspended solids than fine screens, and this sludge will have a moisture content of probably 95 per cent, whereas with screens this 30 per cent would have to be removed in the final tanks with a probable moisture content of 98 per cent.

2. Settling tanks are readily adaptable to grease removal, while fine screens require separate grease-skimming tanks.

3. The material removed in the preliminary tanks is mostly inert and of low nitrogen content, hence the remaining suspended solids are better for fertilizer manufacture.

4. With the heavier material removed by the settling tanks, less air and a shorter aeration period should produce the same degree of purification of the sewage.

5. Under local conditions screenings are somewhat more troublesome to handle and dispose of than settling tank sludge.

6. Fine screens require housing, and this, together with separate grease-skimming tanks, makes them more expensive than the uncovered settling tanks.

Activation will be carried out in sixteen aeration tanks, each consisting of four channels 22 ft. wide and 345 ft. long, with an effective depth of about 15¼ ft.; each tank will have a net capacity of 3,250,000 gal., giving an aerating period, with one tank out of service, of 5¼ hours for the average flow of 180 m.g.d. plus 25 per cent increase for the returned sludge, this amounting to 45 m.g.d. Aeration will be of the spiral-flow type, with a double row of porous plates at one side of each of four channels working in series. Baffles will be set at an angle of 45 deg. in both the top and the bottom of the channels. The porous plates will be set in precast concrete containers.

Air will be supplied by six motor-driven centrifugal blowers. Of these, four will have a capacity of 45,000, and two of 35,000 cu.ft. of free air per minute against a normal pressure of about 7¾ lb. This will permit a *maximum* air supply of 198,450 cu.ft. per minute, or 1.2 sec.-ft. per gallon of sewage at 125 per cent rated capacity (225 m.g.d.) plus 5 per cent of air for aerating the conduits. For *average* working conditions 0.8 sec.-ft. of air per gallon will probably be sufficient, plus 10 per cent for aerating the conduits; or a total of 110,000 cu.ft. of air per minute. For maximum conditions one large blower will be held in reserve, but ordinarily there will be in reserve one small and two large blowers. The large units will require 2,300-hp. and the small ones 1,800-hp. synchronous motors.

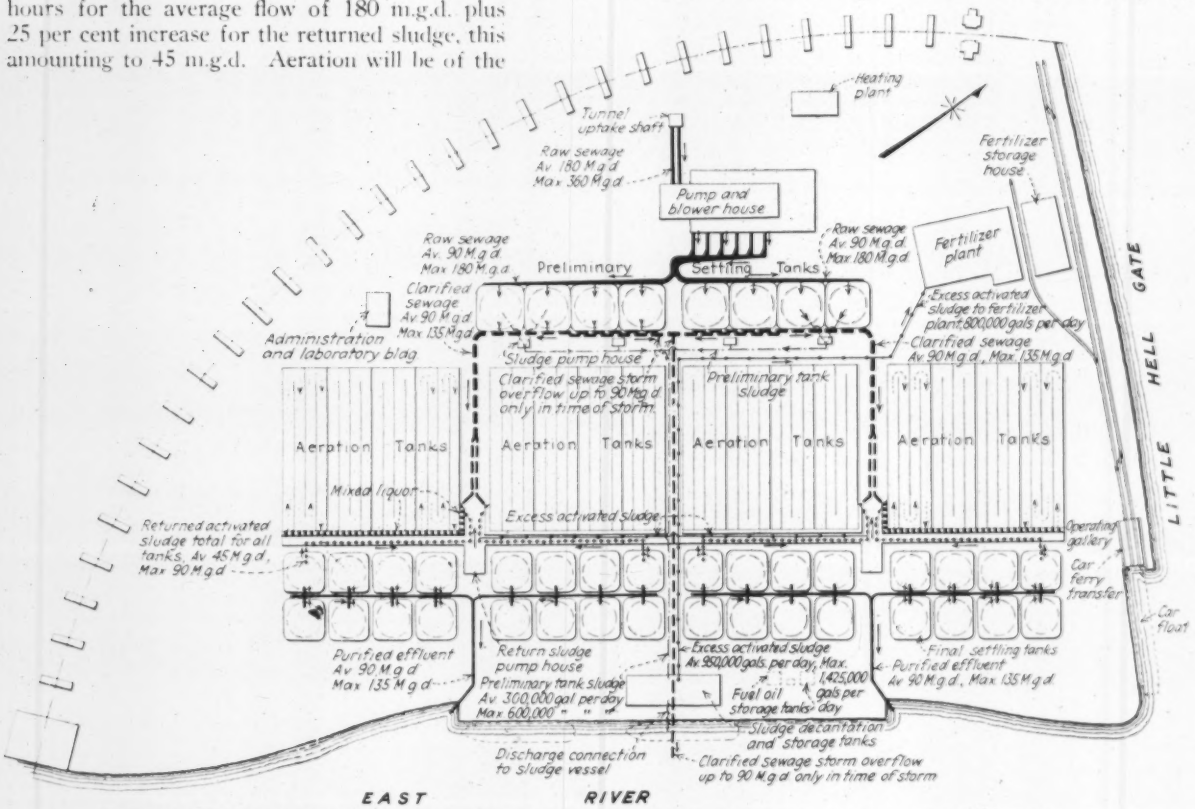
Final sedimentation will be effected in 32 tanks, each with a net surface area of 7,500 sq.ft., giving a rate of operation, with two tanks out of use, of 1,000 gal. per square foot per day, at the average rate of flow, and 1,400 at maximum rate. The contract drawings will provide for bids on two types of apparatus for removing the sludge from the final settling tanks.

There will be two return-sludge pumping stations each with four 15-m.g.d. return-sludge pumps working under 7-ft. head, and three 0.8-m.g.d. excess-sludge pumps, working under 35-ft. head. With one return-sludge pump idle, these pumps will have a capacity of 90 m.g.d., or one-half of the average daily flow of sewage.

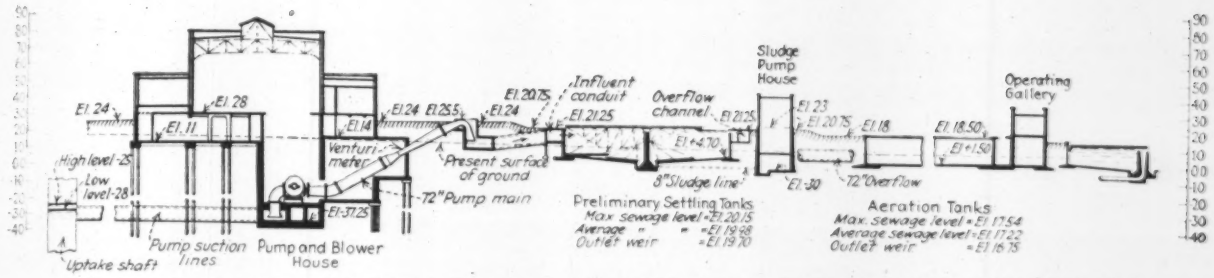
Excess activated sludge (sludge for final disposal as distinct from the sludge returned for activation) will be delivered by the pumps to four main sludge-storage tanks on the dock, each with a capacity of 45,000 cu.ft. These tanks will be of steel, of suspension coal-bunker type. Each tank will have provision for decanting the supernatant liquid. Besides the sludge tanks there will be two 5,000-gal. tanks for receiving the grease and skimmings from the presedimentation tanks. All six tanks will be arranged to discharge by gravity into ocean-going sludge boats.

The boats for sea disposal of sludge will be three in number (unless one is cut out on account of the fertilizer plant, in case that is built). Each boat will have a capacity of 1,500 tons and will be 250 ft. long, 43½ ft. beam and have a molded depth of 16 ft., and draw 11 ft. of water when loaded. Each boat will have twin screws driven by two 600-hp. diesel engines.

Assuming 90 per cent removal of suspended matter, there will be about 140 tons daily of dry solids for disposal. It is estimated that of this 60 tons (dry basis) will be from presedimentation tanks. This will have about 95 per cent water content, making 1,200 tons on


Heating plant
Tunnel uptake shaft
Raw sewage Av. 180 M.g.d. Max. 360 M.g.d.
Pump and blower house
Fertilizer storage house
Raw sewage Av. 90 M.g.d. Max. 180 M.g.d.
Preliminary
Settling
Tanks
Raw sewage Av. 90 M.g.d. Max. 180 M.g.d.
Fertilizer plant
Clarified sewage Av. 90 M.g.d. Max. 135 M.g.d.
Excess activated sludge to fertilizer plant, 800,000 gals. per day
Administration and laboratory bldg.
Sludge pump house
Clarified sewage storm overflow up to 90 M.g.d. only in time of storm
Preliminary tank sludge
Clarified sewage Av. 90 M.g.d., Max. 135 M.g.d.
Aeration Tanks
Aeration Tanks
Aeration Tanks
Aeration Tanks
Mixed liquor
Excess activated sludge
Returned activated sludge total for all tanks, Av. 45 M.g.d., Max. 90 M.g.d.
Operating gallery
Car ferry transfer
Car float
Purified effluent Av. 90 M.g.d. Max. 135 M.g.d.
Return sludge pump house
Preliminary tank sludge Av. 300,000 gal. per day Max. 600,000 " "
Excess activated sludge Av. 950,000 gals. per day, Max. 1,425,000 gals. per day
Fuel oil storage tanks
Final settling tanks
Purified effluent Av. 90 M.g.d., Max. 135 M.g.d.
Sludge detanitation and storage tanks
Discharge connection to sludge vessel
Clarified sewage storm overflow up to 90 M.g.d. only in time of storm
HELL GATE
LITTLE
EAST RIVER

ROUTING PLAN OF PROPOSED ACTIVATED-SLUDGE PLANT ON WARDS ISLAND, NEW YORK CITY



GENERAL SECTION THROUGH PROPOSED ACTIVATED-SLUDGE PLANT FOR NEW YORK CITY

a wet basis. As this will be low in organic nitrogen, it is considered best to send it to sea, regardless of whether or not the fertilizer plant is built. The sludge potentially available for fertilizer will thus amount to 80 tons a day. The report recommends that the fertilizer plant with a capacity of 50 tons a day be built—apparently meaning 50 tons of finished product after the addition of chemicals to the sludge.

Power consumption for the normal operation of the plant is estimated at a total of 8,794 kw. and during stormflow, with maximum air consumption, at 12,960 kw., or 13,650 kva. at 95 per cent power factor.

The estimated cost of the entire project is $17,016,000 without the fertilizer plant and with three sludge vessels; $18,542,000 with the fertilizer plant and with two sludge vessels, or $19,117,000 with the fertilizer plant and with three sludge vessels. The sludge vessels are put at $575,000 each and the fertilizer plant at $2,101,000. All the figures include a 15 per cent allowance for engineering and contingencies.

In view of the litigation against the city of Milwaukee and the Sanitary District of Chicago for alleged infringement of activated-sludge patents, the report recommends that the city of New York assume all liability of patent infringement, which, the report states, "is the course pursued by all cities in this country which have adopted this process."

The contract with Fuller & McClintock, already mentioned, covers only the preparation of the project report on which this article is based, and the contract plans. They have been assisted in the work by Pearse, Greely & Hansen, sanitary engineers; Will J. Sando, mechanical engineer; J. T. Hawley, electrical engineer; Silsbee & Gould, marine engineers; Sloan & Robertson, architects; Cox & Stevens, naval architects, and Noel Chamberlain, landscape architect.

The project was initiated by the Board of Estimate and Apportionment through a special committee composed of Charles W. Berry, Comptroller, and Arthur S. Tuttle, consulting engineer and former chief engineer. Under the charter of the city of New York the construction of sewers and sewage-treatment works to serve each borough is in charge of the respective borough presidents. The Wards Island plant comes under the jurisdiction of Julius Miller, president of the Borough of Manhattan, and it was to him that the report of Fuller & McClintock here abstracted was submitted. Clifford M. Pinckney is chief engineer of the Borough of Manhattan, and Richard H. Gould is chief engineer of the Wards Island sewage-treatment works.

A charter amendment adopted by popular vote on Nov. 5, 1929, provides for a sanitation commission of three members to have charge of sewage disposal, garbage and refuse disposal and street cleaning throughout New York City, which became effective Dec. 1, 1929.

Rating Public Water Supplies on Basis of Purity

A SYSTEM of comparative rating of public water supplies according to the degree of purity and the uniformity with which this purity is maintained has been used for some time in Kansas, with marked success in improving the quality of water supplied to consumers. The rating is based on analyses made at the state Board of Health laboratory. At the recent conference of Iowa water-works operators, at Iowa City, Iowa, this system was described by Earnest Boyce, chief engineer of the Kansas State Board of Health, in a paper of which the following is a summary:

In the rating of municipal water supplies in Kansas, the definite purpose is to obtain comparative data on two items: (1) the quality of the water from a bacterial standpoint, and (2) the uniformity with which this quality was maintained during the year.

In operation, the supplies are divided into surface waters and groundwaters. Since surface waters are treated, their quality needs more frequent checking. It is provided, therefore, that samples of treated water shall be given a bacterial analysis weekly and that there shall be a field test of the purification works once a year. One complete chemical analysis is made each year on both surface and ground water supplies. For groundwaters, only two regular sets of bacterial analyses are made each year, but additional analyses are made as may be necessary in checking up contamination.

Our rating number is the product of the number of weekly smples free from B. coli, multiplied by the total number of samples. Thus a perfect record of 52 sets of excellent or good samples would give a rating figure of 5,200. These comparisons are sent to all water superintendents concerned. We have records now for a six-year period, and the progressive improvement indicates that these comparisons have been worth while. In 1923 only six places had a rating above 4,500, but in 1928 there were 38 cities which exceeded this figure.

We are now listing all groundwater supplies that do not meet the bacterial standards prescribed by the U. S. Public Health Service for use on interstate carriers. As this rating is on the bacterial basis only, it does not give a complete picture of the sanitation of the supplies, but the failure of a supply to meet these standards should lead to investigation.

Breaks in German Gas Mains Due to Cold

Official reports have been issued by several German towns on the prevalence of gas main accidents during the severe winter of 1928-1929, described by Carl H. Pollog in *Engineering News-Record* of Sept. 26, 1929, p. 496. Interesting comparisons are made with the conditions experienced during the preceding mild winter of 1927-28. Koblenz and Halle recorded 23 and 65 such accidents respectively during 1928-29, and none at all during the previous year. Berlin had 39 cases on record for the cold year, and only five during 1927-28. Fires having their origin in gas leakage showed corresponding differences in their frequency. The property damage attributed to such fires has been estimated as $7,000,000 for the first two months of 1929.

Electric Equipment for Operating Doors of Goodyear-Zeppelin Airship Dock

Limit Switches and Hydraulic-Operated Brakes on Two-Speed Motors Provide Nearly Automatic Control for Each of the 450-Ton Doors

By W. C. Raube

Industrial Engineering Department, General Electric Company, Schenectady, N. Y.

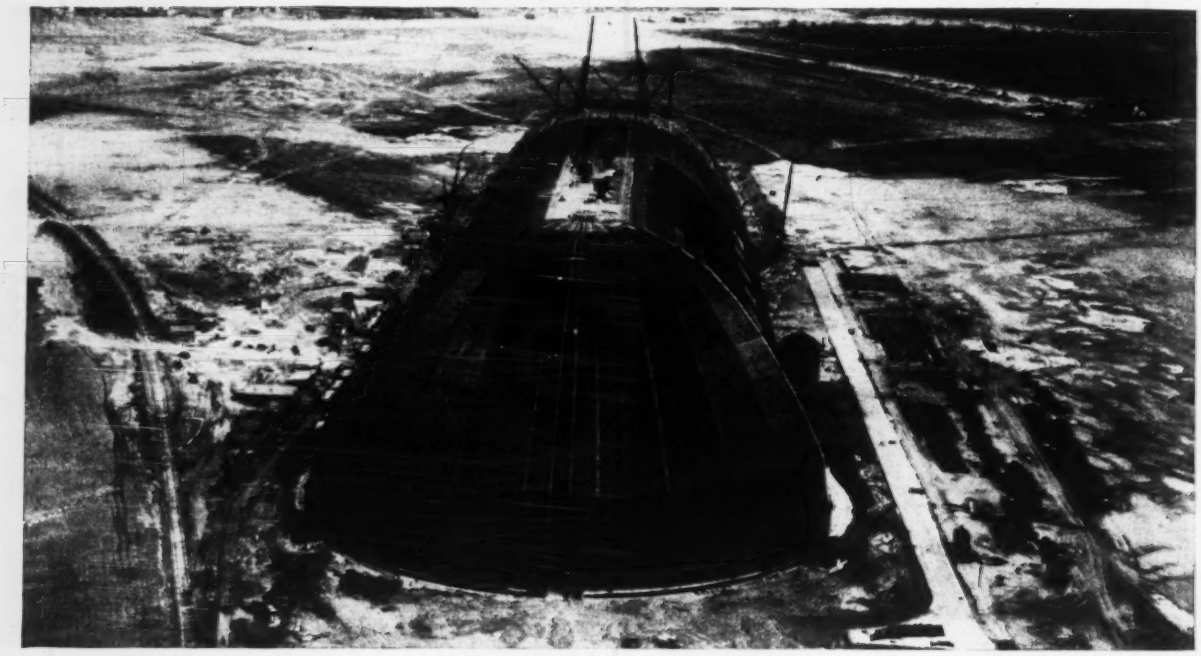


FIG. 1—ORANGE-PEEL DOORS ON GOODYEAR-ZEPPELIN AIRSHIP DOCK
Small buildings near outer edge of doors house the operating equipment. Part of Akron municipal airport now in use may be seen in right background.

THE DOORS of the new Goodyear-Zeppelin airship factory and dock now nearing completion at the Akron (Ohio) municipal airport constitute a unique feature of this remarkable structure. Similar buildings with similar doors have been built in Germany in much smaller sizes, but this represents their first use in the United States. Articles describing the Goodyear-Zeppelin dock have appeared in *Engineering News-Record* as follows: April 11, 1929, p. 583, and Dec. 5, 1929, p. 874.

This article will be confined solely to the doors and their operating mechanism.

In place of straight vertical doors moving in and out on a horizontal track as in the case of the Lakehurst (New Jersey) and Scott Field (Illinois) docks, the doors of the Akron dock conform to a spherical surface or "orange-peel" shape. There are two doors at each end supported on a common vertical pin at the apex, while the bases are mounted on railway car trucks running on a circular track extending around the sides of the building. Thus when the doors are open, they will fit closely along the sides of the dock, providing a full opening at the ends. One of the major reasons for adopting this type of construction was to reduce cross-wind currents, which hinder airship docking and launching operations.

In opening and closing, each of the 450-ton doors is propelled by a 200-100 hp., intermittent-rated, 600-300-r.p.m., 440-volt, three-phase, 60-cycle, two-speed, wound-rotor-type induction motor equipped with a motor-mounted, hydraulic-operated brake, and controlled from an automatic, magnetic pushbutton control. The pushbutton station has four buttons—one forward, one reverse, one to permit a jogging operation and one for stopping. Limit switches are provided to give automatic slowdown and to stop the doors at each end of travel. The use of a two-speed motor operating in conjunction with the slow-down limit switches reduces the impact shock to the doors when coming together at the center of the doorway.

To operate one of the doors in the forward direction, for example, the forward button is pressed. This operation applies power to the motor with high-speed connections, and the door is automatically accelerated to full speed. Speed-torque curves are shown in Fig. 2 for acceleration to full-load speed K for a typical load condition requiring a torque of X. Acceleration is under the control of definite-time, flywheel-type relays attached

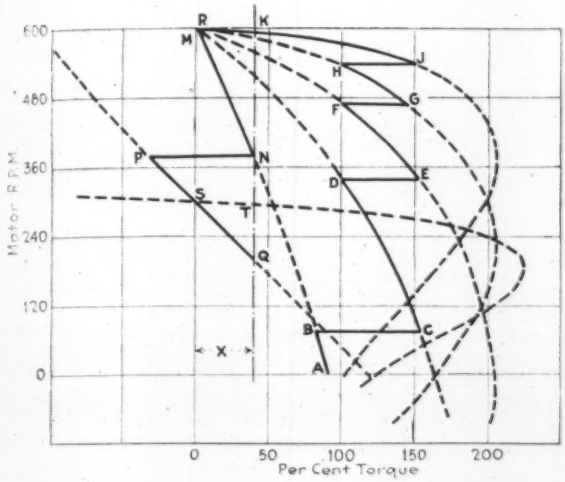


FIG. 2—SPEED-TORQUE CURVES FOR DOOR-OPERATING ELECTRIC MOTORS, ZEPPELIN AIRSHIP DOCK
Curve *A-B-C-D-E-F-G-H-J-K* is typical. Near *K* a slowdown limit switch is tripped, causing the motor to change to resistance curve *M-N*, then along curve *P-S-Q* until final stop limit switch is tripped.

to the individual accelerating contactors so the torque-speed curve *A-B-C-D-E-F-G-H-J-K* of Fig. 2 results. The door continues operating at full speed *K* until near the end of travel in the forward direction, when the first slowdown limit switch is tripped. This operation inserts resistance in the motor secondary winding with the result that the motor is thrown to the resistance curve *M-N*. The speed of the motor then decreases from *M* to *N*, at which point operation continues until the second slowdown limit switch is tripped.

The tripping of the second limit switch disconnects the motor from the high-speed winding and connects it to the slow-speed winding, and would result in operation along the curve *S-T*, except for the fact that resistance is left in the motor secondary circuit, thus causing the motor to continue to operate on the slow-speed resistance curve *P-S-Q*. The resistance is left in the motor secondary circuit so that, when changing over from the high-speed to the slow-speed connections, this resistance will serve as a buffer to give smoother deceleration during the change-over. Thus, the motor is thrown from the point *N* on curve *M-N* to the point *P* on curve *P-S-Q*. The motor now continues operating on curve *P-S-Q* and the speed decreases, reaching point *Q*, at which point operation will continue until the final "stop" limit switch is tripped. The latter switch causes the power to be entirely disconnected and allows the brake to set. To reverse the travel of the door the reverse button must be pressed. The operation for that direction of travel is exactly the same as described for the forward travel.

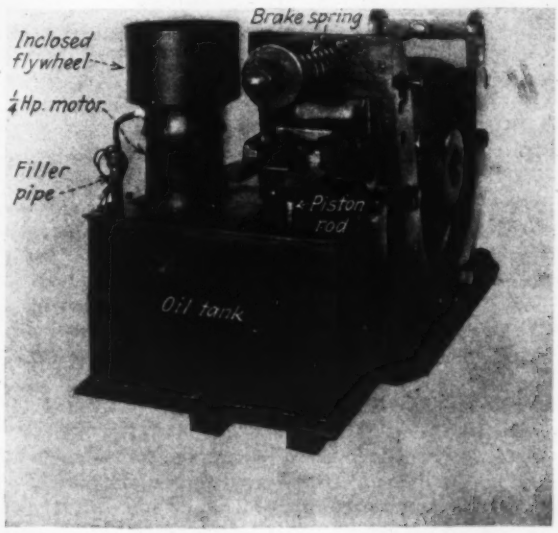


FIG. 3—HYDRAULIC OPERATOR WITH FLYWHEEL TO DELAY APPLICATION OF MAGNETIC BRAKE

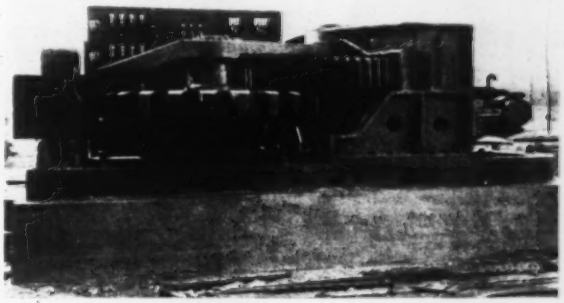


FIG. 4—DOOR-OPERATING EQUIPMENT, ZEPPELIN AIRSHIP DOCK
Large pinion in foreground meshes with rack along bottom of door. Motor control panel shown in background. This equipment was later inclosed in houses shown in Fig. 1.

In order to prevent a too sudden shock on the door when the brake sets, a definite-time lag in the setting of the brake is required. With such time lag, the door has a chance to decelerate because of the rolling friction, thus allowing it to come to rest or at least to decelerate to a very slow speed before the brake is applied.

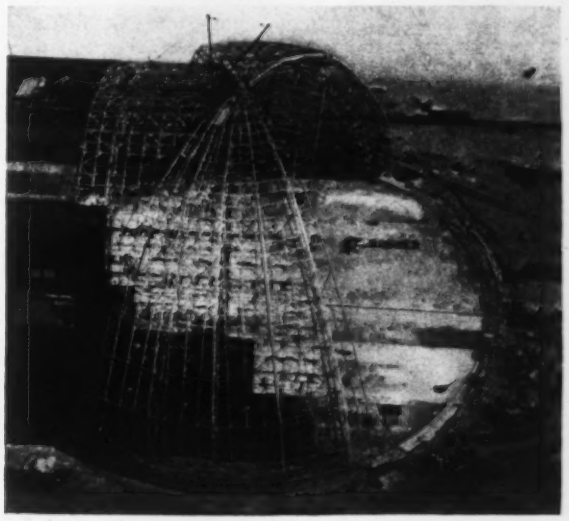


FIG. 5—FRAMEWORK OF AIRSHIP DOCK DOORS IN FULL-OPEN POSITION
Doors revolve on semicircular track

A hydraulic-operated brake is provided to secure this time lag. In this type of brake, the conventional solenoid is replaced by a hydraulic operator (Fig. 3), which consists of an oil cylinder with a ¼-hp. motor mounted

on the top. A small impeller attached to the motor forces oil through an orifice against a piston which is connected through a piston rod to the brake levers. When the piston is forced up, the spring on the brake is compressed, which in turn releases the brake shoes. When power is disconnected from the impeller motor, the impeller decelerates, allowing the oil to run past the impeller blades, the compressed spring forcing the piston down and at the same time forcing the brake shoes against the brake wheel.

In order to obtain an appreciable time lag in this brake setting, a small flywheel is attached to an extension of the impeller motor shaft. This flywheel is made up of laminations so that, by adding or removing laminations, greater or less flywheel effect can be secured. Thus with the greater flywheel effect, a longer time is required to slow down the impeller, and the oil pressure is maintained under the piston that much longer, thus keeping the brake released for a longer interval. Adjustment of from one to four seconds is secured in this manner. A slip friction clutch is used between the motor and flywheel, permitting the motor and impeller to come up to speed quickly.

To facilitate accurate spotting of the door at any point within the limits of the stop limit switches, a "jog" button is provided. To jog the equipment, the button must first be depressed and then, depending upon the direction of travel required, the forward or reverse button must be held down. This operation is obtained on the slow-speed winding of the motor so that if the jogging lasts long enough to permit all of the accelerating contactors to close, operation at half speed along curve *S-T*, Fig. 2, will be secured.

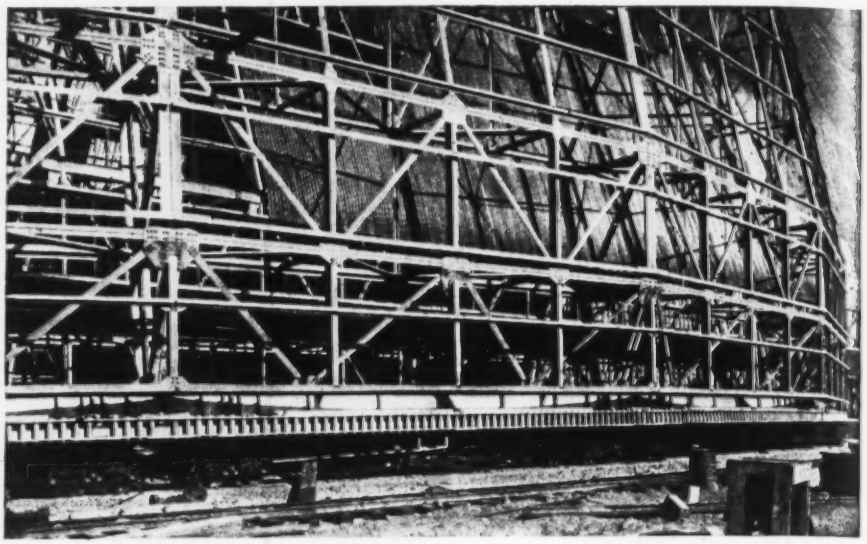


FIG. 6—RAILWAY TRUCK MOUNTING OF AIRSHIP DOCK DOORS
Note operating rack along bottom of framework which meshes with pinion shown in Fig. 4. Doors are shown in full open position before covering was put on.

The dock was designed by Dr. Karl Arnstein, vice-president and chief engineer, Goodyear-Zeppelin Corporation. The detailed engineering was done by Wilbur Watson & Associates, Cleveland, under the supervision of Dr. Arnstein and his department, while the actual construction of the building was under the direction of W. C. State, consulting engineer, Goodyear Tire & Rubber Company. The General Electric Company furnished the electric equipment, while the gearing and other machinery was manufactured and installed by the Wellman-Seaver-Morgan Company, Cleveland, Ohio.

Refuse Salvage Plant, Manchester, England

AS A part of a five-year program for improving its means of refuse disposal, Manchester, England, put into use on July 31, 1929, a new refuse-handling plant which separates the refuse into dust, cinders, salable products, combustible and non-combustible tailings. The plant has a working capacity of 120 long or about 135 short tons in eight hours, which is the official working period. Provision to treble the capacity has been made.

On arrival at the plant the refuse is dumped in a hopper of 20 short or 22½ long tons capacity, from which a drag-bar conveyor moves it to a screening table at a higher elevation. All material up to 1-in. size, including dust, cinders, nails and small pieces of garbage, is dropped from the screen to a magnetic separator, while all the larger material, or tailings, go on for the operations noted below.

From the magnetic separator the fine material, except the metal, goes to a rotary screen, in two sections. Everything that passes ⅜-in. openings (classed as "dust") is moved by a conveyor to a 50-ton (56-short ton) storage hopper on the river side, with chutes for loading it into barges for conveyance to farmers or other users. From the second section of the rotary screen, ⅜- to 1-in. stuff goes to a "garbage waste extractor," which removes "clean cinder" for delivery to a storage hopper for loading on vehicles. The garbage removed by the extractor, together with the material rejected by the rotary screen, joins the tailings from the sorting table, and all three classes of waste go to the incinerators, the heat from which is used to raise steam for works purposes.

As already stated, everything over 1 in. in size, or all material that will not pass through the first set of screens, goes to a picking table. Here paper, rags, rope and tins are removed for sale. Glass and stone are picked out and sent to bins. All that remains from the screening and sorting processes goes to the incinerators.

The cleansing committee proposes to mix the "dust" with offal and refuse from the slaughter house adjacent to the refuse plant and sell the mixture as "town manure." The cleaned cinders are rated as having a heat value of 8,000 to 9,000 B.t.u., or two-thirds that of slack coal.

Bertram B. Jones is director of the Manchester cleansing department and Petrie & Naught, Rochdale, England, were contractors for the new plant here described. A few additional details are given in *Municipal Engineering* (London), Aug. 8, 1929.

Shunt System of Operating Filtered-Water Reservoirs

By Feeding as Many Pumps Directly From Filters as Demand Permits and Drawing on Reservoir for the Remainder Detroit Saves an Average of 5 Ft. Suction Head at High-Lift Pumping Station

By Eugene A. Hardin
Designing Engineer, Department of Water Supply, Detroit, Mich.

IN CONNECTION with the improvement and enlargement of the water supply at Detroit, Mich., it is thought that a new feature in economy in waterworks operation has been inaugurated. In many water-purification plants where the filters discharge into filtered-water reservoirs, there is a considerable loss of power due to the fact that the water, in entering the filtered-water reservoir, drops over a weir or other inlet device down to the level of the water in the reservoir. As the reservoir level falls during the day, when its stored water is used to augment the filter plant output during the daily peak demand, in many plants there would be a lowering in suction head at the pumps of as much as 10 and possibly 20 ft. every day, depending on the relationships of pumpage demand, filter output, reservoir capacity, reservoir depth and like details of the plant design, if actual operation were carried out as contemplated in their design. In large plants the loss of power due to this drop is recognized as a source of considerable operating expense, and to overcome it the reservoirs are ordinarily kept filled to as high a level as possible. Thus the filter plants are required to follow closely the hourly demands, a method of operation which obviously requires larger filter plants than would be necessary if advantage could economically be taken of the reservoir storage. The final result is that the economic limit of the filter-plant capacity is often reached long before it would be if the loss of power due to the drop in the reservoir levels could be materially reduced.

At the Detroit plant these facts were recognized and means were sought to avoid this loss of power. Accordingly, while on a program of enlargement of the existing works, a plan was developed by which about three-fourths of this loss is saved. The saving amounts to an average of about 5 ft. of suction head on all the water pumped at the Detroit Waterworks Park plant. On the basis of the present pumpage rates and power costs this will effect a saving of about $15,000 per year in high-lift pumping costs.

The plan adopted is a method of delivering a considerable portion of the filtered water directly to the suctions of a majority of the high-lift pumps at a constant high level without passing it through the reservoir at all, while a few pumps draw from the reservoir. These pump groups and their suction conduits are normally separated and are equivalent to having two separate pumping stations, one pumping direct from the filter plant and the other pumping from the reservoir. For flexibility it is arranged so that the number of pumps on the reservoir may be increased or decreased as desired by manipulating valves in division walls in the suction galleries of the pumping station. By keeping the pumpage from the direct system slightly less than the filter-plant output the water level in this system remains at about the filter-effluent level. For safety the two systems of suction conduits are cross-connected and check gates in this connection will permit water to flow from the reservoir should the water level in the direct conduit system fall below that in the reservoirs.

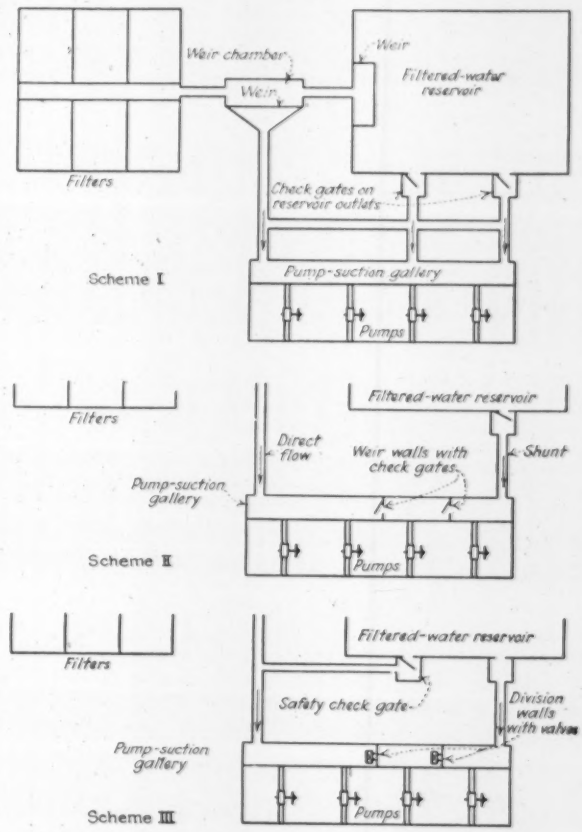


FIG. 1—THREE SCHEMES FOR SHUNT FILTERED-WATER RESERVOIR

1. Pumps and suction system are all in one group. Check gates close when reservoir is filling and suction level rises to weir levels. Suction head saving is on water pumped during off-peak hours.

2. Pumps and suction conduits are divided into two groups by the use of weir walls between pump suctions. Direct-flow or high-level water is supplied to a majority of pumps. Pumps are automatically shifted from direct group to reservoir group by the lowering of water levels on weir walls between pumps and consequent opening of check gates in weir walls when suction level on a given pump drops below the reservoir level. Suction head saving is on about 85 per cent of water pumped, but head loss in system due to weirs and gates reduces the net saving.

3. Pumps and suction conduits are divided into two groups by fully closed division walls between pump suctions. Direct-flow or high-level water is supplied to a majority of pumps. A small group of pumps remains connected to reservoir for long periods. Pumps are added to or subtracted from this group by opening and closing valves in division walls. Operation is manual and follows gages which indicate water levels on weirs and in reservoirs. Suction head saving is on about 80 per cent of water pumped, with small added head losses due to the system.

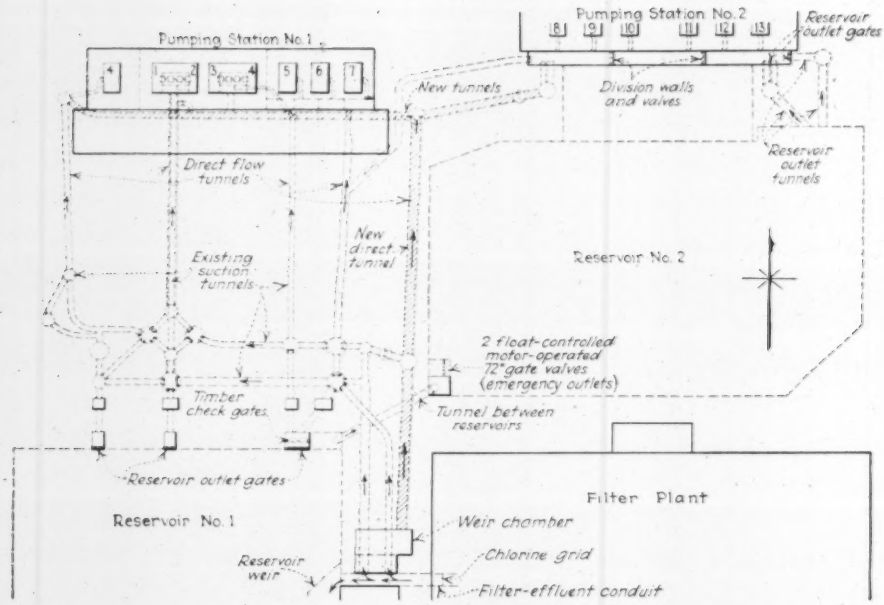


FIG. 2—GENERAL LAYOUT OF WATERWORKS PARK PLANT

The flow from filter plant to pumps is therefore by way of two systems of conduits: a direct system which carries most of the flow, and a shunt system on which is located the filtered-water storage reservoir. The daily demand rates at Detroit are comparatively uniform, hence only about 12 per cent of a day's supply must be drawn from the reservoir to equalize the filtering rate throughout the day. On this basis it is estimated that 80 per cent of the water filtered may be drawn direct from the filter plant, allowing for inefficiencies in operation.

Since the reservoir is on a shunt in parallel with the direct conduits, this system of operating between filter plant, filtered-water storage reservoirs and high-lift pumps has been named the "shunt reservoir system."

In working out the plan used at Detroit, three general schemes were considered for reducing the loss of power due to the drop over the reservoir weir. These three schemes are indicated diagrammatically in Fig. 1 and are briefly outlined below the diagrams.

After a thorough study of the existing conduits, connections and structures at the Waterworks Park plant at Detroit and considering the arrangement of the pumps, suction galleries and other details of the plant, it was decided to use scheme 3. A general layout of the system as completed at the Waterworks Park plant is shown in Fig. 2.

In order to apply the shunt reservoir system certain new construction was necessary. To divide the flow from the filter plant there was built across existing conduits a special diversion weir chamber which could be used for the direct flow and was connected to the filter-plant effluent main. An additional direct-flow conduit (shown shaded in Fig. 2) was built to reduce the velocities in the suction tunnel system, which had already become rather high at the maximum rates of flow. A second reservoir, which was under construction, was connected in series with the existing reservoir and the outlet from the new reservoir was connected to the remote end of pumping station No. 2 so that the pumps in that end of this pumping station would be

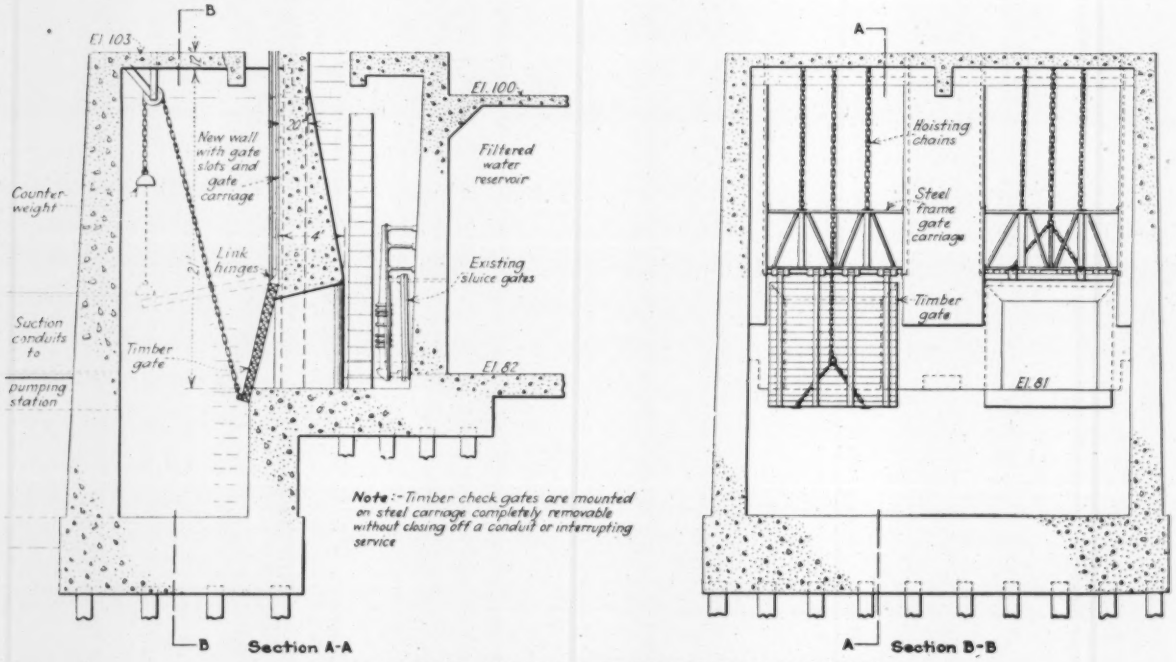


FIG. 3—TIMBER CHECK GATES ON RESERVOIR OUTLET

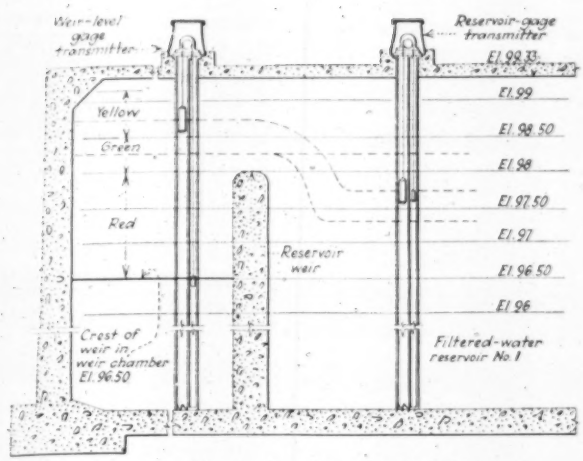


FIG. 4—DIAGRAM OF WATER LEVELS AT RESERVOIR WEIR
Indicates location of water-level floats and gage transmitters.

able to draw from either the reservoirs or the direct conduits as desired. The existing valves in the division walls of the suction gallery of pumping station No. 2 were motorized and minor repairs were made at both pumping stations to take care of the higher water levels expected on the direct-conduit system. Since the existing division walls divided the pumps into pairs, it would have been desirable to build additional walls across the suction gallery and divide the pumps singly, but this could not be done without inconveniently long shutdowns of the station.

The diversion-weir crest in the weir chamber was placed at a level which would insure a water seal on the filter effluents at all times. The crest of the existing weir wall in the old reservoir was raised so that there would be but a small flow of water over it when the diversion weir was submerged 1½ ft., at which submergence the loss of head over this weir would be very small.

One of the outlet chambers on the old reservoir was equipped with timber check gates as shown in Fig. 3. A feature of these gates is that they can be withdrawn and repaired without making any shut-off. For additional emergency outlets to the reservoirs, two float-controlled, motor-operated 72-in. gate valves were provided at the northeast corner of the new reservoir. The floats controlling these valves were set so that they would cause the gates to open when the water level in the direct conduits should fall below a certain elevation and then close when the water rose above this level again.

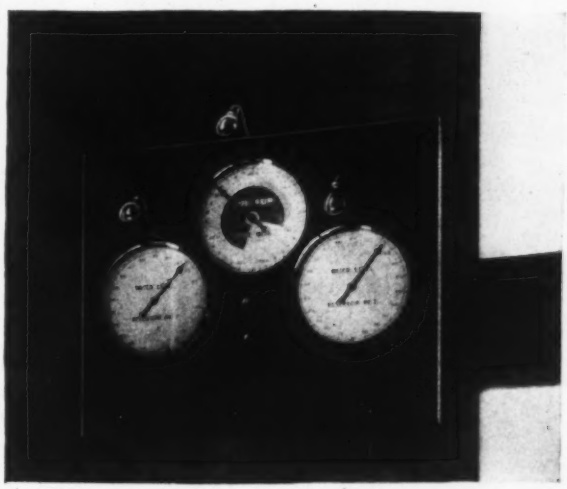


FIG. 5—WATER-LEVEL GAGES IN PUMPING STATION NO. 1

The chlorine grid was moved a considerable distance upstream in the filter effluent conduit above the point where the flow would divide so that a thorough mixing of the chlorinated filter effluent would be assured before the division of flow at the weir chamber. This has proved to give a satisfactory distribution of the chlorine.

Cross-connections between old and new conduits were constructed and certain repairs and other improvements were made on the suction conduit system while this construction was in progress.

Water-Level Gages—In order to have the information by which to operate the pumps on the shunt system,

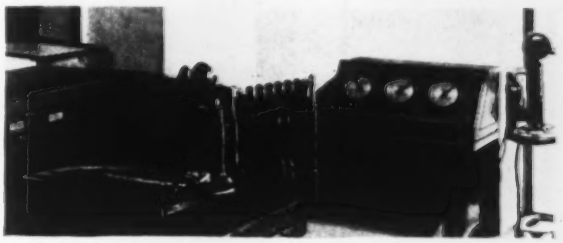


FIG. 6—WATER-LEVEL GAGES AT SUPERINTENDENT'S DESK

sensitive and dependable water-level gages were required which would give the head on the weirs and the water levels in the reservoirs. Since these gages are a vital link in the system, considerable study was given to them before the type of gage was selected. The self-synchronizing motor type of gage was chosen, since it involved no complicated mechanism and appeared to be sound in principle as well as being very simple and reliable.

Three float-operated water-level transmitter units were installed: one back of the reservoir weir and one in each reservoir. Fig. 4 shows the location of gage transmitters and indicates the water-level stages which are used as control points. Each transmitter actuates three gage dials: an 18-in. diameter gage in each pumping station and a 4-in. gage in the filter-plant superintendent's office. The three gages in each pumping station are mounted on a panel board as shown in Fig. 5. The center gage shows the water levels on the weirs and is used as a guide for the operation of the pumps. The full range of this gage is 3 ft. At this scale water levels may be read to 0.01 ft. and tenths of a foot may be easily distinguished at a considerable distance from the gage. To assist the pump operators in operating by this gage the face of the indicator dial is colored in sectors. The sector including the water levels below the crest of the reservoir weir is colored red to indicate danger when the gage pointer falls in this area unless pumpage from the direct high-level system is reduced. The sector covering the first half-foot range of levels above the reservoir weir crest is colored green, indicating that when the gage pointer is in this area all is well. It is in this range that it is desired to operate at all times except when the reservoirs should be filled above this level. The sector which includes all possible water levels higher than 0.5 ft. above the reservoir-weir crest

is colored yellow, which indicates that when the pointer is in this area a change of pumps from the reservoir to the direct conduits is desirable.

For further operating information the two reservoir-level dials are used. The gage on Reservoir No. 2, which is nearest the pumps, is equipped with a switching device which lights a white light when the reservoir level is rising and a red light when the level is falling.

The group of 4-in. indicator dials in the filter superintendent's office is installed in a small cabinet which is mounted on wall brackets near his desk as shown in Fig. 6.

The gages were supplied by the Electric Indicator

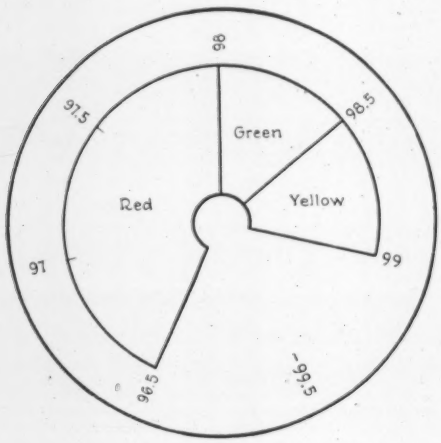


FIG. 7 — WALL CHART TO GUIDE PUMP OPERATORS UNDER SHUNT-RESERVOIR SYSTEM

1. Try to maintain the pointer in green area.
2. If pointer drops into red area, more pumps should be put on the reservoir system (pumps 10, 11, 12 and 13 can be put on reservoir system).
3. If pointer enters yellow area, more pumps should be put on the tunnel system to obtain best operation.

Corporation, of Stamford, Conn., and have proved very satisfactory.

Operating Experience—When the plant was ready to be put on the shunt system of operation, all of the outlet gates on the reservoirs were closed except those discharging immediately to the pumps at the west end of pumping station No. 2 and the gates back of the timber check gates on reservoir No. 1. Then the gates in a division wall in the suction gallery of pumping station No. 2 were closed. It was a convincing proof of the head saved by this system when the water on

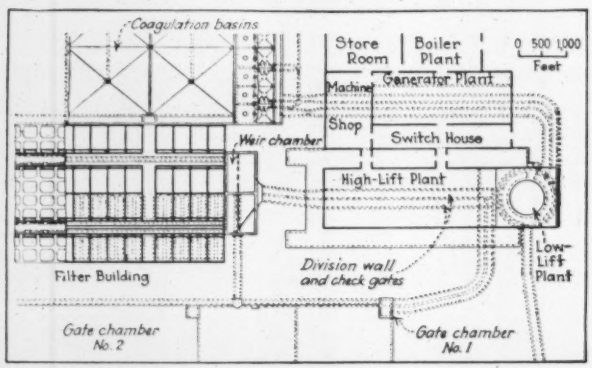


FIG. 8 — SPRINGWELLS STATION LAYOUT FOR SHUNT-RESERVOIR SYSTEM

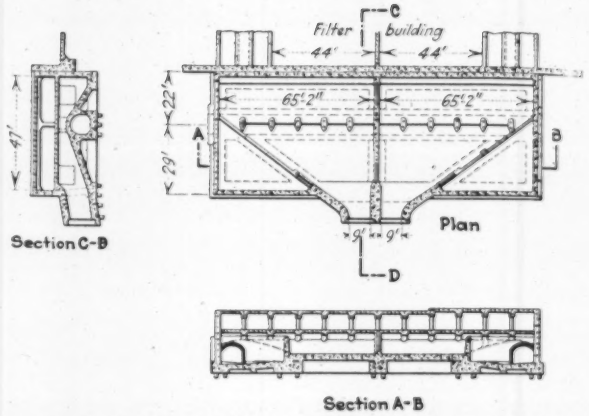


FIG. 9—WEIR CHAMBER AT SPRINGWELLS STATION

one side of this division wall gradually rose to within a few inches of the top of the chamber while the water level on the other side remained at the reservoir level, as had formerly all of the supply. No change was made in the pumps when the first trial was made, and it was noted that the usual pump operation would not be greatly affected by the new system. The only noticeable change was the rise in the suction water level at about 75 per cent of the pumps. The head saved may be seen by noting the water levels on the gages in the photograph in Fig. 5, which was taken while in operation on the shunt system. At the time the photograph was taken the reservoir water level was at El. 91.5, while the level in the direct conduits was at about El. 97.5, a difference of about 6 ft. Since the reservoir level may be allowed to drop as low as El. 86, it is evident that a saving of considerable suction lift is being effected by the shunt system. Another point of note in the view is that the pointer of the weir-level dial is in the red area, indicating that a part of the pumpage must be shifted from the direct-flow conduits to the reservoir shunt. It has been found more practicable to change the pumps at this plant rather than the division-wall gates; therefore, as a rule, certain pumps always take suction from the reservoirs and are used as necessary to keep the proper division of flow. The change in water level at the weirs is very slow and gives ample time to make the required adjustment of pumps. For the convenience of pump operators an instruction chart (Fig. 7) is mounted on the wall of each pumping station near the water-level gage panels.

The Waterworks Park plant has been in operation on the shunt system regularly since Feb. 24, 1929, except for a short period when making structural repairs. No inconvenience or operating difficulty has been encountered beyond the repair of a few leaks near the tops of the pump-suction chambers found by the constant high-water levels. After operating for this length of time it can be confidently stated that the system is a success. Some concern was felt at first in regard to the division of the flow so soon after chlorination and the short time of contact of the chlorine before discharge into the distribution mains, but frequent tests have shown very little difference in residual chlorine between the water pumped into the mains from the direct conduits and that pumped into the mains from the reservoirs.

The results of the shunt-reservoir operation of the Waterworks Park plant were so satisfactory that provisions are being made in the design of the new plant now under construction on the opposite side of Detroit

to operate it by the shunt system. In designing the new plant it was an easy matter to arrange the plant and conduits so that the shunt system could be applied with very little increase in cost. Fig. 8 shows a general layout of the proposed new plant, part of which is under construction.

Scheme 3 was adopted again in the new plant, there being some objections to being tied up to an automatic system. In this plant the safety check gates are located in the division walls of the pumping station and therefore no cross-connecting conduit is necessary. The weir chamber used in the design of the Springwells plant (Fig. 9) is different from that used at the Waterworks Park plant in that it contains both the filter-seal weir and the reservoir weir and that all the filter-plant output passes over the seal weir first and then divides, going directly to the pumps or going over the reservoir weir to the filtered-water reservoirs on the shunt, as the case may be. It is believed that passing all the water over one main weir will give a better mixing of the chlorine and assure a uniform chlorine dose in the two routes of flow to the pumps. On account of the shape of the main weir and its submergence the head loss predicted over it is about 3 in. at maximum flow.

The existence of the problem solved by the shunt system was first recognized and the general idea leading to its solution was first conceived by George H. Fenkell, superintendent, general manager and chief engineer of the Detroit Department of Water Supply, and all work was done under his general supervision. The definite solutions and details were worked out by A. B. Morrill, assistant engineer of this department, and the writer. The actual designs, construction details and supervision of construction were carried out by a staff of engineers under the direct supervision of the writer and J. W. Orton, assistant civil engineer of the department.

Design History of Most Artistic Steel Bridge Erected in 1928

THE recent designation of the self-anchored suspension bridge over the Allegheny River at Sixth St., Pittsburgh, Pa., as the most artistic steel bridge erected during 1928 recalls some of the factors which entered into the original choice of this type of structure. The first consideration, according to V. R. Covell, chief engineer of the bureau of bridges of Allegheny County, was a strongly expressed desire on the part of civic bodies and leading citizens that the Sixth St. bridge and its two companion bridges at Seventh and Ninth Sts. should be so designed as to afford the best possible view for those using the bridges.

The desired type was a deck structure, but the requirements of the War Department for clearance above pool level would have demanded long and high approaches, or else a gradient too steep for safety. Such approaches, with the necessary street changes, would occasion excessive property damages without any corresponding advantages—conditions which virtually ruled out the deck bridge. The use of a simple span or cantilever type would have met the grade conditions, but would not give the desired clear view from the roadway nor would it meet the esthetic requirements. After these types had been eliminated, consideration of a suspension bridge was natural.

Another consideration which had its effect on the design was the necessity for improving the south bank of the river in the vicinity of these three bridges. There was a sharp division of opinion regarding the proper method that this improvement should follow. One group of city planners urged the construction of a river wall along the harbor line with the area between the wall and Duquesne Way (a street which parallels the river from its mouth to Eleventh St.) filled to the top of the wall. If this were to be done it would have been possible to construct an ordinary masonry anchorage immediately back of the river wall. A second group of these planners urged that a driveway be constructed along the riverbank just back of the harbor line, at a level which would permit bypassing traffic under the bridge approaches. Such a driveway would be flooded a few days each year, but nevertheless would be a link in a bypass system around the riverfront and thus help to lessen the traffic interference at these and other bridge approaches. If this scheme were to be carried out, however, an anchorage of the usual type of suspension bridge would have had to be placed back of or south of the driveway, so as to leave room for the bypass. The cables, too, would have had to be carried over the driveway in the floor system of the bridge.

While such a method of improvement would have been satisfactory so far as the depressed driveway was concerned, it would not have been satisfactory with the bank filled in level out to the harbor line, as it would then be necessary to carry the cables in concrete just below the roadway level. Also it would have been necessary to locate the north anchorage beyond the railroad tracks and carry the cables in the floor system with close clearance above the tracks. Slipping which had occurred on the north anchorage of the old Seventh St. bridge (a suspension structure of the usual type) showed that the construction of a masonry anchorage on the north bank would prove unusually expensive.

No money was available at that time for either method suggested by the city planners for improving the south riverbank. Also there was no one in a position to render a decision on the method of improvement which would be binding in the future. And finally because of unfavorable conditions on the north bank, the use of a masonry anchorage was abandoned and the self-anchored suspension type, which had been successfully constructed in Europe, was adopted.

With this type of bridge, either one of the suggested treatments for the riverfront improvement was available, since there would be no construction back of the harbor line that must remain permanent. The determination to use the eye-bar chain followed an investigation which showed that it could be anchored to the stiffening girders much more readily than could a wire cable. Also the use of eye-bars made possible the erection of the bridge as a cantilever, as described in *Engineering News-Record* Sept. 23, 1926, p. 502, for the Seventh St. bridge. An article outlining the original plan for these three bridges was published in *Engineering News-Record* Dec. 18, 1924, p. 995.

The designs for the bridge were worked out by the engineering department of the department of public works of Allegheny County under the general direction of Norman F. Brown, director, and C. M. Reppert, assistant director. They were prepared by V. R. Covell, chief engineer of bridges, C. J. Wilkerson, consulting engineer, and A. D. Nutter, engineer of bridge design. The city art commission also played an important part in determining the type of structure to be used.

Water-Tamping of Fills in Texas Expedites Highway Work

Settling by Jetting and Ponding Successfully Used for Several Years—Methods, Experience, Difficulties and Costs

By A. J. Wise

Resident Engineer, in Charge in Harris County, Texas State Highway Department

JETTING and ponding methods for highway embankment settlement have been used with pronounced success in the construction of the $7,000,000 highway system of Harris County, Tex. Inquiries from various parts of the country show surprising interest. Yet the processes now appear simple and easy, the results seem perfect and the cost is relatively small. In the beginning it is desired to acknowledge the value of an idea which came to us through the *Engineering News-Record* (March 11, 1926, p. 417) about the time the extensive highway construction program of Harris County began in 1925, from a description of a process of water-settling a bridge approach in Illinois.

The first experiment in forcing fill settlement was tried after the failure of a concrete slab near Plum Creek between Houston and Galveston, laid on a fill that had been compacted by traffic for three years. We had a similar fill to contend with at Pine Gulley on the same road. The public needed the highway badly, of course. We jetted and ponded it thoroughly, soaking water into every inch of it. Then we rolled it with heavy tractors before smoothing off the grade and laying the pavement. There has been no settlement.

The same process has been used with the greatest satisfaction on other portions of the Houston-Galveston road, particularly a 10-mile stretch that had to be rushed to completion before the Democratic national convention. This portion was graded and the fills water-tamped in less than a month and the road paved in about 55 days. The entire job required only about 80 working days. (*Engineering News-Record*, Sept. 27, 1928, p. 466).

FIG. 1—JETTING HIGHWAY FILL ON HOUSTON-AUSTIN HIGHWAY

Under a pressure of 65 lb. jet holes on 5-ft. centers are driven to natural ground surface and filled so long as they will take water.

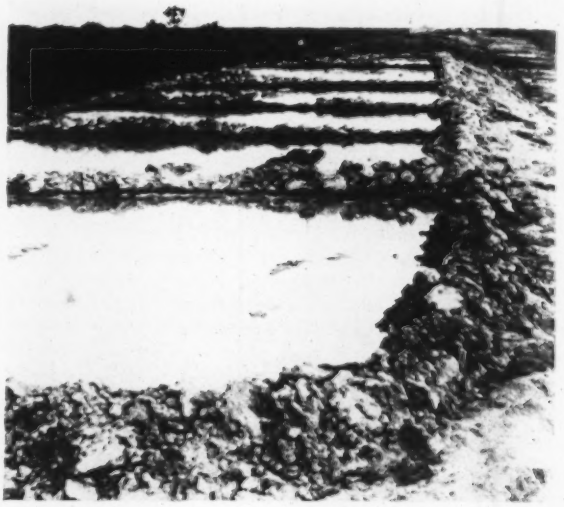


FIG. 2—EMBANKMENT PONDED AFTER BEING JETTED

In one particular instance we have had occasion to observe the value of the water-tamping process on a deep fill. On a highway through a virgin forest, two years ago, we built an embankment of 18 to 25 ft. to connect with a concrete and steel bridge over what is known as Green's Bayou. The embankment has stood as solidly as the earth upon which it was built, though put to the test of the most severe rain and flood conditions in 75 years.

State highway specifications provide that the jetting and ponding shall be performed at points indicated by the plans, or as directed by the engineer, not less than three weeks in advance of the laying of the pavement, or at such longer period of time prior thereto as practicable. The strictest conformity to specifications is required. Specifications require that the ponding method shall be used generally on fills ranging from 18 in. to 4 ft. in height, and the jetting method on higher fills.

Jetting Procedure—Pressure jetting is accomplished by using 1-in. pipe with a ½-in. nozzle. The pressure of the water at the nozzle is 65 lb. per sq.in. The jet holes are first opened by spudding with a heavy iron bar. Holes are made 3 ft. deep and not farther apart than 5 ft. on centers. Into these holes the jet nozzles are inserted, delivering full pressure of water.

As long as the fill will take the water, the jet must remain in the hole. When the water begins to overflow through the top of that hole or adjacent holes, the jet is forced down into the fill until it reaches a point not closer than 2 ft. from the bottom of the fill. Here it is left to remain until the water again overflows the top of that hole or the adjacent holes, or oozes out of the sides of the fill. If a hole has to be abandoned temporarily because of leakage of water from the fill, the jet is again applied to it after the adjacent holes have been jetted.

Jetting is repeated at intervals of not less than three days, as often as may be necessary, in the opinion of the engineer, to settle and compact the fill thoroughly. In subsequent jettings the holes are made midway between the holes used for the previous jetting. Vertical jetting only is used, as jetting the slopes causes slides.

The most frequent difficulties are caused by water finding subterranean channels and running out near the

bottom of the embankment, causing slides and washouts. When a condition such as this is discovered, the jet should be removed at once and placed in a different position. Usually applications of the jet on each side of the leak will stop the leakage. When this plan fails, it is advisable to let that portion of the embankment lie idle for about a week and then to repeat the treatment.

Immediately after completion of the jetting process, ponds are constructed on top of the embankment and left until the embankment is thoroughly saturated, as a rule about a week. The ponding is done by constructing transverse dikes across the trench section at intervals of 100 ft. or less, close enough so that the entire area between dikes may be flooded with water. Ponding is continued by adding water from time to time until the roadbed is thoroughly saturated and settled. The water is then drawn off and the roadbed permitted to dry out until it can be rolled thoroughly by a 10-ton crawler tractor. A 10-ton roller is used to compact the surface further. The surface is finally brought to true line, grade and cross-section. In case ponding is not started within ten days after completion of preliminary grading, the hard earth crust formed by the action of traffic or other causes is broken up by means of plowing or other method approved by the engineer, for the full width of the trench section. Then the ponding is started.

In Harris County, for the most part, 25 gal. per cubic yard of embankment has been sufficient for the water-tamping process. During dry weather about 50 gal. per cubic yard has been required. The average cost of settlement of fills by this process has been about 2½c. to 5c. per cubic yard.

The theory upon which we have operated has been that, no matter how much traffic passes over a fill and no matter how long it is allowed to settle according to natural processes, voids will remain near the bottom of the embankment. These voids remain indefinitely, but will allow further settlement.

Largest Underwater Tunnel Under Construction in England

Single Vehicular Tube Beneath Mersey River to Carry Four Traffic Lanes—Will Be Completed in June, 1932

WORK is now going forward on a single-tube vehicular tunnel under the Mersey River to connect Liverpool and Birkenhead, England, which will have a total length of 2.16 miles and an interior diameter in the underwater section of 46 ft. 3 in. As is shown by Fig. 2, the tunnel will carry four lines of vehicles abreast, with ample space for ventilating air ducts. Although the tunnel cross-section shows a space beneath the roadway alloted to street cars, these have not been definitely decided upon.

Plans for improving communication between the two boroughs have been under consideration for more than three-quarters of a century. In 1922 a committee of three engineers was appointed to make a study of the problem and to report upon the feasibility of improving facilities for cross-river traffic by means of a bridge or tunnel. After an exhaustive study these engineers reached the unanimous conclusion that a tunnel would best meet the traffic requirements. Accordingly, after approval of the plans had been secured from Parliament in 1925, work was started in that year on the driving of a preliminary tunnel along the line of the future main tunnel to explore the ground. The two headings of the preliminary tunnel met beneath the middle of the river in April, 1928, and shortly thereafter a contract for the enlargement to full section of the underwater portion was awarded. The approaches in Liverpool and Birkenhead were awarded on separate contracts in November, 1928, and March, 1929.

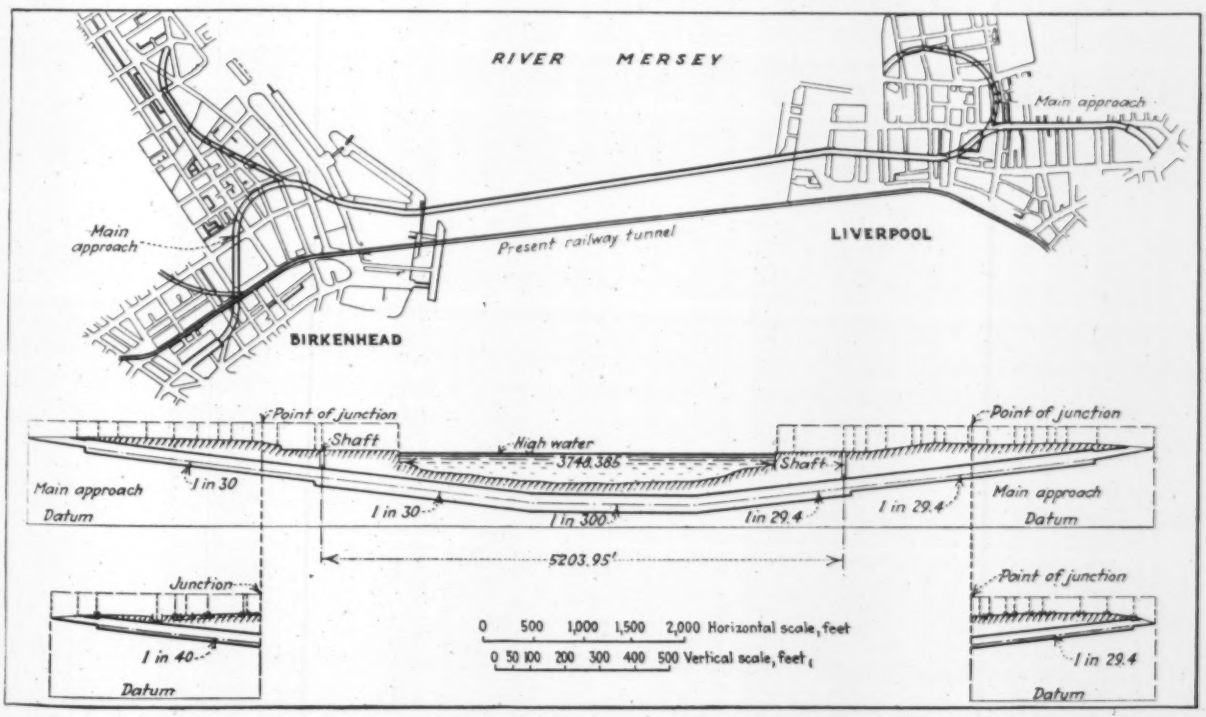


FIG. 1—PLAN AND PROFILE OF VEHICULAR TUNNEL CONNECTING BIRKENHEAD AND LIVERPOOL, ENGLAND

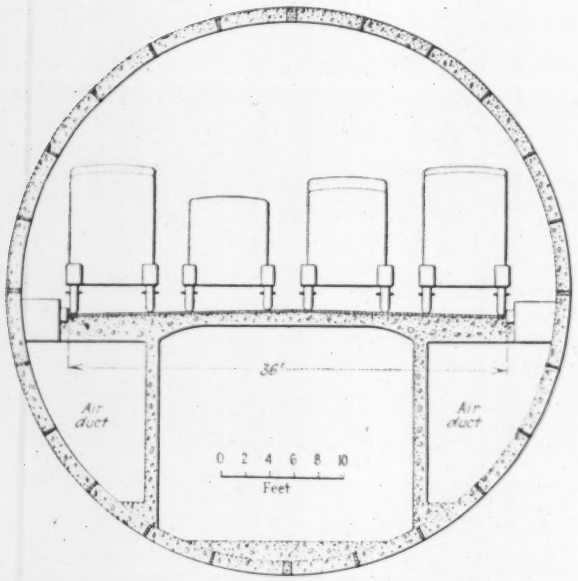


FIG. 2—CROSS-SECTION OF MERSEY VEHICULAR TUNNEL

Double approaches are provided on both sides of the river. The 36-ft. roadway used in the underwater section is continued throughout the main approaches on each side and, in addition, branch approaches from sections near the riverfront are provided with roadway widths of 18 ft., accommodating two lines of traffic. The length from portal to portal of the main tunnel is 2.16 miles; through the dock side approaches it is 2.08 miles. The total length of tunnel is 2.9 miles, all in sandstone. Roadway gradients are, for the most part, 1 in 30, with a maximum of 1 in 29.4 on the Liverpool approach. The usual cast-iron lining is to be used, sealed with cement grout and concrete on both exterior and interior.

Ventilation will be taken care of by three plants on each side of the river which will supply a total of nearly 4,000,000 cu.ft. of fresh air per minute. It is expected that the maximum proportion of carbon monoxide will not exceed 4 parts in 10,000. The system of ventilation to be used has not yet been definitely determined; studies are now being made of the relative advantages of transverse and longitudinal ventilation.

Present plans call for completion in June, 1932, at an estimated cost of approximately $25,000,000, of which the English government will contribute over $12,000,000. The balance of the cost will be met by loans, secured by toll charges to be maintained for a maximum period of 25 years, and also by funds to be provided by the two cities.

Automobiles Responsible for More Deaths Than Five Diseases

The death rate from automobile accidents for September, 1929, among 19,000,000 insured persons in the United States and Canada was larger than the combined rate for typhoid fever, measles, scarlet fever, whooping cough and influenza, according to the October *Statistical Bulletin* of the Metropolitan Life Insurance Company, as summarized in *Public Health Reports* for Nov. 22, 1929. The automobile death rate was 22 per 100,000 and the total rate for the five diseases mentioned 18.7. The typhoid rate was 3.1 per 100,000 and the death rate from all causes was 753.1 per 100,000.

Land Commission Adopts Outline of Scope

Organizes in Three Sections—Scope of Inquiry Covers Surface Rights, Minerals and Reclamation

ON NOV. 23 and 25 the commission appointed by President Hoover to consider cession of public lands to the states and revision of reclamation laws met at Washington under the chairmanship of James R. Garfield and organized its work in three sections. These will deal respectively with (1) surface rights in public lands, (2) mineral rights, and (3) reclamation policy. Outline drafts of scope and subdivision of the inquiry were considered and made the tentative basis for the detail work. The chairman was authorized to seek an appropriation of $50,000 for expenses of the commission.

Study of public-land questions is to cover among other subjects the following: cession of unreserved land to states; reservation of grazing lands near reclamation projects; reservation of reservoir sites for stream control; revision of forest and park areas; state co-operation in reduction of forest fire losses; amendment or repeal of homestead, timber and stone, leasing and other land laws; future status of Land Office; consolidation of land survey agencies.

As to mineral rights, the inquiry will deal with effect of transfer to states upon conservation of resources; desirability of reserving phosphates and like minerals; control of waste of oil by overproduction; inclusion of oil shales with oil lands; division of proceeds in case of cession.

Water and reclamation problems are to be studied with respect to both water administration and land development. On the one hand federal and state responsibilities for stream study and control, and feasible policies on the construction of storage reservoirs for flood control, power or water utilization will be considered. On the other the benefits, difficulties, costs and methods of reclamation are to be studied in the light of present and future conditions contrasted with those existing when the reclamation act was passed. The relative spheres of state and federal action and possible co-operation are to receive special attention. Further, the question of doing public development work on private land, and the wisdom of reconstructing failed private projects at public expense, will be discussed. Amount of public subsidy of irrigation, interest payment, assessment on benefited parties other than irrigators, promotion of successful land development, and a large group of related matters are also included in the outline.

The membership of the commission includes representatives from all the public-land states and various citizens of general interest, including Mary Roberts Rinehart, author.

Vera Cruz Awards Road-Building Contract

A concrete and asphalt road, 66 miles long, to cost about $930,000, will be built between Jalapa, Vera Cruz, and the city of Vera Cruz. The contract has been awarded to the Sociedad de Constructores Mexicanos, of Mexico City, subject to the approval of the state legislature.

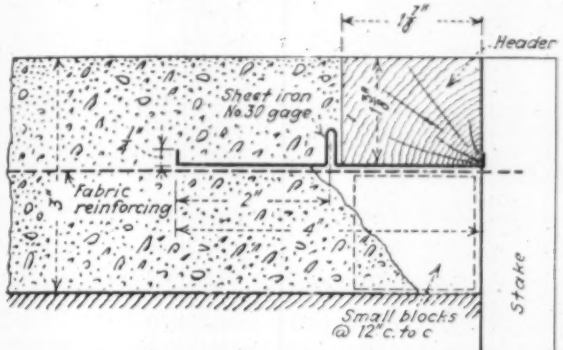
From Job and Office

Hints That Cut Cost and Time for the Contractor and Engineer

Providing Oiltight Contraction Joint in Reservoir Lining

IN PLACING a 3-in. concrete lining in a 2,500,000-bbl. oil reservoir for the General Petroleum Corporation near Los Angeles, galvanized-iron strips were used to form oiltight contraction joints between panels. The lining was laid on a rolled-earth subgrade and had 6x6-in. wire-mesh reinforcing at the center of the slab.

The floor was poured in alternate panels, 12 ft. wide. Joints between panels consisted of a No. 30 gage gal-



SHEET-IRON CONTRACTION JOINT FOR CONCRETE RESERVOIR LINING

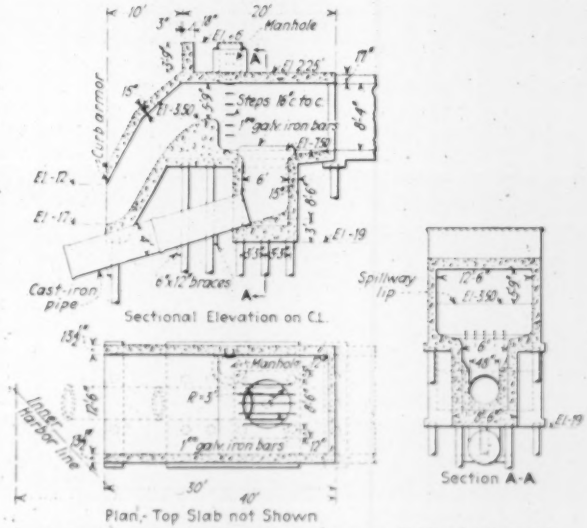
vanized-iron strip bent to the form shown in the accompanying sketch. These strips were placed on the reinforcing fabric along the edges of the panels to be poured first. A timber header, placed on the outside half of the strip, was supported on small wooden blocks and held in position by stakes along the outside edge.

Pouring was done with a dry mix and the concrete was spaded under the contraction-joint strips until it occupied some of the space beneath the header. No difficulty was encountered in preventing an excess of concrete from running under the contraction joint during pouring, according to W. H. Richardson, of the corporation's engineering department. The stakes, header and blocks were removed before pouring the intervening panels, leaving one-half of the sheet-iron strip to form a bond and produce an oiltight contraction joint.

The reservoir was built by the Robinson-Roberts Company, contractor, of Los Angeles.

Sewer Overflow Chamber Separates Sanitary and Storm Flows

THE West Hanford St. trunk sewer recently built in Seattle, Wash., to carry the discharge from a combined sewer system into the east waterway terminates in an overflow chamber supported on piles on the shore side of the inner harbor line. This point marks the beginning of a cast-iron outfall 4 ft. in diameter extending on the harbor bottom a distance of 400 ft. farther into the waterway. The design of the overflow chamber is such that only the flow during the dry



DETAILS OF OVERFLOW CHAMBER, WEST HANFORD ST. SEWER, SEATTLE

season passes through the pipe outfall on the harbor bottom. Whenever the flow exceeds the capacity of this pipe, an overflow, shown in the accompanying drawing, allows the surplus to discharge directly into the waterway at the shore line. The sanitary sewage flow in this outfall is about one-tenth the total flow when the sewer is carrying heavy storm runoff.

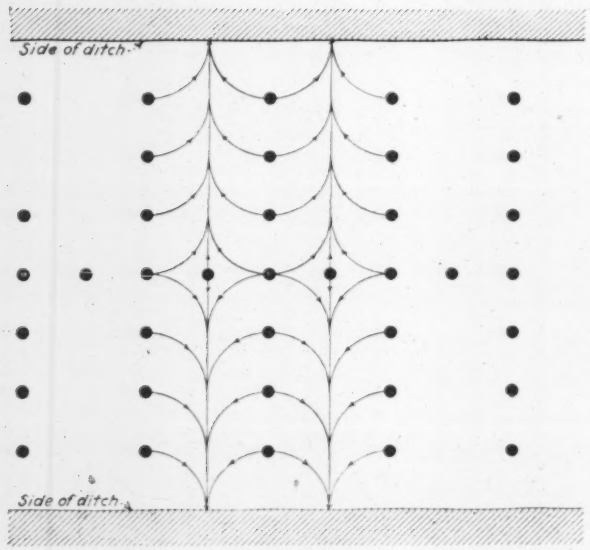
The trunk sewer, in its approach to the overflow chamber, has a rectangular section of 8 ft. 4 in. x 12 ft. 6 in. Just inshore from the termination of this section a pipe 6 ft. in diameter leads downward through the invert and delivers to the 4-ft. pipe constituting the sanitary outfall. Beyond the down-lead a spillway lip rises 4 ft. above the elevation of the invert and prevents overflow until a head of 4 ft. is built up on the cast-iron outfall. Flows in excess of the pipe capacity under that head discharges freely into the waterway over the spillway lip.

Designs for the structure were prepared by the engineering department, city of Seattle, and construction was carried out by the General Construction Company, Seattle, Wash.

New Ditch-Blasting Methods

GREATER efficiency in the blasting of ditches can be obtained by two new methods of loading, developed by A. J. McAdams, formerly of the faculty of the University of Missouri and now connected with the agricultural extension section of E. I. du Pont de Nemours & Company. These are known as the "air-space" and "cross-section" methods.

The first of these is for blasting narrow ditches by means of a single row of explosives. The usual process is to place all cartridges at the bottom of the hole or as near thereto as possible. Tests show, however, that by leaving an air space between the bottom charges and a cartridge placed near the top, a deeper ditch can be



CROSS-SECTION METHOD OF PLACING EXPLOSIVES FOR DITCH EXCAVATION

obtained with the same amount of explosive. Comparative sections loaded by the old and new methods under identical conditions with equal amounts of explosives showed, in one case, average depths of 3 and 4.1 ft. respectively, an increase in depth of more than one-third.

The cross-section method of loading applies to wider ditches requiring more than a single row of holes. The usual practice is to load two or more parallel rows of explosives lengthwise along the ditch. The new method uses only one row of holes along the center of the ditch and parallel to it, while the rest of the holes are placed in rows at right angles to the center line spaced 3 to 6 ft. apart, depending on the type of soil. The advantage of this method, shown in the accompanying illustration, is that much more of the material is thrown clear of the ditch. As is well known, the force of an explosion is equal in all directions. With the usual method of loading, part of the force of each separate explosion is equalized, and some of the earth moved from one row to another has a tendency to fall back into the ditch. Reference to the diagram will show that, by the cross-section system of loading, the lines of force from each row of charges join in a semicircle whose resultant is predominately toward the side of the ditch being blasted, so that much more of the material is thrown clear.

Dynamite Removes Reinforced-Concrete Counterweight on High Crane

AN UNUSUAL job of blasting was done at Wilmington, Del., recently when dynamite was used to crack and break down a 160-ton reinforced-concrete counterweight 107 ft. above the ground on a hammerhead or fitting-up crane at the plant formerly operated by the Bethlehem Shipbuilding Corporation on the Christiana River. The approximate size of the block was 14x17x 9 ft. It was inclosed on the sides, ends and bottom by structural steel and was reinforced with ¾-in. rods, 4 in. on centers, anchored to steel beams at each end of the framework. Poured monolithically in place, the concrete was firmly bonded to the structural steel. In addition to the reinforcing, there were two diagonal steel struts extending through the block.

Original plans to blow out the concrete with a single shot of a series of holes of 6-ft. depth were changed to break down the slab with several smaller shots to prevent damage to the steelwork and to boats anchored at a near-by wharf, one of which was within 150 ft. of the crane. About three-fourths of the concrete was blown out by an initial shot using 25 lb. of 50 per cent dynamite loaded in holes. The remaining concrete was removed

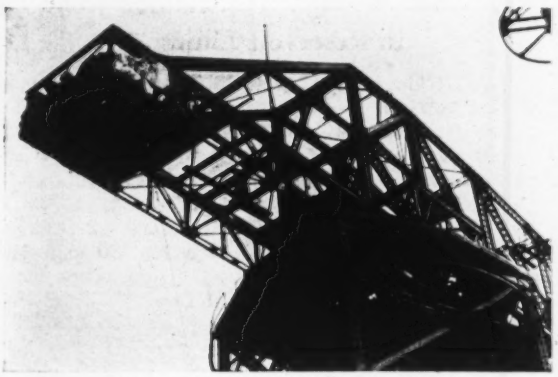


FIG. 1—REINFORCED CONCRETE COUNTERWEIGHT ON HIGH CRANE, PARTIALLY DEMOLISHED BY FIRST SHOT OF DYNAMITE

by three mudcapping shots, using 7, 12 and 9 lb. of dynamite each. Electric caps were used on all of the shots. C. G. Mathewson, of Wilmington, did the loading

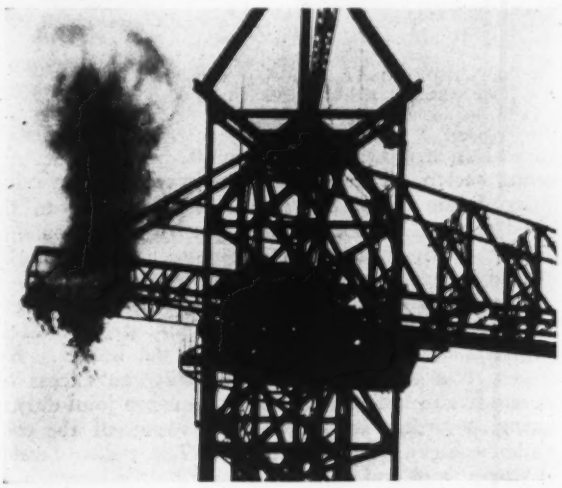


FIG. 2—FINAL SHOT IN DEMOLISHING THE COUNTERWEIGHT

and shooting. He was assisted by J. W. Koster, of the explosives department of E. I. du Pont de Nemours & Company.

UTILIZATION of little-used gravel side streets for playgrounds is to be tried out in Sweetwater, Tex., a city of 12,000 population. Block lengths average about 300 ft., street maintenance expense is heavy and there is a deficiency in recreation space. Following a study of the situation, it was decided to close alternate streets, increasing the average block length to approximately 650 ft. and utilizing the area so gained for parkways and neighborhood play parks. The City Plan Commission, co-operating with the city commission, the city manager and the park board, has actively undertaken the development of the first units in this system, and expects to establish new units as fast as neighborhood demands arise. Plans for the project were developed in the office of Myers, Noyes & Forrest, engineers, of Dallas, who are preparing a city plan for Sweetwater.

Letters to the Editor

Cleaning Brush in Vyrnwy Aqueduct Lost and Found Again

Sir—I have read with great interest the article in your issue of Sept. 12, 1929, p. 405, on British Water Pipe Practice and Experience. Some further information regarding the whalebone pipe brush, used to clean the upper end of the Vyrnwy conduits, as described in the article just mentioned, may interest your readers. In July this brush was put into operation and everything went well until it was taken out at the first hatchway chamber, a distance of 3½ miles from the starting point. It was found that only the two front elements had arrived, the rear or trailing element being missing.

It was not possible to put the main out of commission and search for the missing part, so water was passed through the main for about three months with only a slight reduction in the delivery. It was then decided to attempt to recover the missing part, and for this purpose the remaining portion of the brush was again put in, at the same point as before.

To keep the two elements in their proper relative positions they were connected by rigid metal stays. The brush passed through the main for a distance of nearly 2 miles, when it was heard to have stopped at a main stop valve. Fortunately this was close to a hatchway chamber, and when the main was opened the missing element was found in front of the brush.

The cause of the accident was then discovered and is interesting. As you are aware, the brush is moved by successive openings of sluice outlets on the main. The brush had come to rest with the rear element right over a sluice outlet, and while in this position water was being discharged through the sluice.

Although the outlet is radial from the center of the pipe, it has a sharp bend, and the escaping water must have exerted a tangential force on the perimeter of the element, thus causing the whole element to revolve. Unfortunately this rotation took place in the opposite direction to the screw on the link connecting the back element with the front portion of the brush, and it was evident that this had only two threads left in engagement when the brush moved forward, with the result that the back portion was left behind. The brush was not intended to revolve, and no locking device had been incorporated in the link.

Fortunately the accident had no serious consequences, and the experience gained will be useful in the future.

Liverpool, England, Nov. 7, 1929.

J. R. DAVIDSON, Water Engineer.

[By inadvertance, the two views of the brush in question, shown in our issue of Sept. 12, were ascribed to the Birmingham water-works.—EDITOR.]

Spiral Flow in the Activated-Sludge Process of Sewage Treatment

Sir—In view of the letter of Charles H. Hurd, published in your issue of Nov. 7, 1929, p. 738, the following facts about the inception and development of spiral-flow treatment in England may prove of interest to the readers of *Engineering News-Record*.

The first English spiral-flow tank was installed at St. Albans, England, in 1917. The first design for this tank was completed on Oct. 30, 1916. Deflecting baffles, as used later at Indianapolis, were not included in the original construction, but were added during 1918 (see accompanying view).

The results obtained using the deflecting baffles in conjunction with the spiral flow in the St. Albans tanks were so satisfactory that a glass tank was constructed by Jones & Attwood, Ltd., at its works at Stourbridge, England, to endeavor to estimate the value of the deflecting baffles. It was observed during these experiments that the curved baffles caused a reduction in velocity near the floor of the tank. Taking this into consideration, together with the fact that the atmospheric surface was appreciably reduced, resulting in a reduction in interfacial contact between the sewage and the atmospheric air, it was finally concluded that the tank which gave the best results was the open tank without baffles.

After the completion of these experiments, the city engineer of Manchester (J. B. L. Meek) and the chief chemist (Dr. Ardern) visited the works at Stourbridge to inspect the working of the glass tank with and without baffles. In consequence of this visit a tank designed to treat a million gallons of sewage per day (1.2 U.S. m.g.d.) at Davyhulme, Manchester, was constructed without deflecting baffles. It

SPIRAL FLOW ACTIVATION TANK AT ST. ALBANS, ENGLAND

After the original construction, deflecting baffles were added. The tops of the baffles are flat, but concrete, shaped to the requisite curve, is filled in beneath.

was considered that the spiral-flow method without deflecting baffles gave a better circulation than the ridge-and-furrow method which had previously been used.

Various forms of spiral-flow tanks with and without baffles are illustrated in the British patent of April 27, 1918, taken out by Jones & Attwood, Ltd.

It will thus be seen that English ideas on spiral-flow treatment, both with and without deflecting baffles, were published well in advance of the experiments carried out by Mr. Hurd, of Indianapolis, which resulted in the construction of the large plant in that city.

It may be of further interest to your readers to know that the spiral flow as installed at Manchester became for some years standard practice in England. There is, however, a tendency at the present time to return to the ridge-and-furrow bottom with the ridges arranged longitudinally instead of transversly as used in the first plant installed at the Withington sewage-works in Manchester.

London, England, Dec. 3, 1929.

P. A. SANDFORD, Managing Director, Activated Sludge, Ltd.

* * *

Sir—I thank you for sending me an advance copy of the foregoing communication from Mr. Sandford, referring to my letter in your issue of Nov. 7. As previously stated, I believe spiral flow in the treatment of sewage is not sufficiently understood. In my letter I intended to differentiate between the use of wide tanks with deflecting baffles and narrow tanks without baffles.

Properly designed angular baffles, in correct relation to air diffusers, accelerate circulatory velocities without perceptibly reducing surface atmospheric contact. It is believed that curved baffles, referred to by Mr. Sandford, are less effective.

Indianapolis, Dec. 16, 1929.

CHARLES H. HURD, Consulting Engineer.

News of the Week

U.S.S. "Lexington" to Supply Power to Tacoma, Wash.

Generating Plant of Airplane Carrier Tied to Municipal System as Emergency Measure

PERMISSION to use the electrical equipment of the airplane carrier "Lexington" as an emergency source of power for Tacoma, Wash., was granted by the Navy Department Dec. 12, as noted in *Engineering News-Record*, Dec. 19, p. 984. Despite the fact that several days of rain and snow have ended the unprecedented drought which crippled the city's hydro-electric plants, the offer of the Navy Department has been accepted for a period not to exceed 30 days in order that sufficient water may be stored at the Cushman Lake plant to carry the system through the low-water period usually experienced during the freezing weather in January and February. Actual physical connection between the "Lexington" and the city distribution system was made Dec. 18.

City's Generating Facilities

To comprehend the reasons back of the city's request for this power an understanding of the status of the city's generating facilities is necessary. These consist of the 40,000-kw. Lake Cushman hydro-electric plant with usable storage of 350,000 acre-ft. of water with a full reservoir; the streamflow of the Nisqually hydro-electric plant, having a capacity of about 24,000 kw. when the flow of the stream permits full-load operation; and a 9,000-kw. steam plant. The backbone of the system is the Cushman development with its full reservoir, with existing generating equipment, equal to 60,000,000 kw.-hr. In the 91-square mile watershed of this plant in the Olympic Mountains there is estimated by the U. S. Geological Survey to be an annual precipitation of 140 in., of which 120 in. is accountable in runoff. During the two years ended this month—years in which conditions of exceptional drought were experienced generally over the entire Northwest—the recorded precipitation at the Cushman plant was as follows: full calendar year 1928, 78 in.; Dec. 1, 1928, to Dec. 1, 1929, 36 in.

The next step in this development, now under construction and scheduled for completion in November, 1930, is a plant on Hoods Canal, utilizing the Cushman Lake water after it passes through the present plant, at a static head of 475 ft., the elevation between present tailwater and tidewater. In ad-

(Continued on page 1025)

ERECTING BASCULE SPAN, ARLINGTON MEMORIAL BRIDGE

This unusual view shows the building of the last main span on the multiple-arch bridge across the Potomac River at Washington, D. C. Pylons in the foreground are at the Virginia end of the main river section. The Lincoln Memorial appears in the background. The length of bridge shown in the illustration is 2,108 ft. The Phœnix Bridge Company, Phœnix, Pa., is the contractor on the bascule span.

Caisson Attackers Indicted for Murder Conspiracy

Seven members, including the secretary, of Local 67, Foundation and Compressed Air Workers Union, of Jersey City, were indicted Dec. 17 by the Hudson County Grand Jury for conspiracy to commit murder by cutting the air line on a caisson on the Hackensack River bridge in which three sand hogs belonging to another union were at work. Details of the attack, on Nov. 23, were given Nov. 28, 1929, p. 866. About 30 of the Jersey City local attacked the air lock, cutting off the air supply and then badly beating the three trapped workers as they emerged from the lock, two of them exhausted after a 65-ft. climb from the bottom. The caisson was one being sunk for the west approach structure to the new Pennsylvania passenger line bridge over the Hackensack near Kearny, N. J.

Consolidation Plan Puts Railroads Into 19 Large Systems

Unification of Large Terminals Is Important Feature of Plan of Commerce Commission

CONSOLIDATION of all the railroads of the country into nineteen large and two small systems is recommended to Congress in a report of the Interstate Commerce Commission made public on Dec. 21. The commission's report is made in compliance with the transportation act of 1920, which requires it to prepare such a plan before giving final approval to any proposal for grouping two or more railroads into a single system.

A tentative plan for the consolidation of the railroads into a number of systems was published by the commission in 1921. It was based upon one prepared for the commission by Prof. William Z. Ripley, of Harvard University. That plan proposed the setting up of nineteen systems and thus agrees in number, at least, with the present plan. (Two of the 21 systems outlined in the present plan are set up to include the railroads in this country controlled by the Canadian National and the Canadian Pacific.) However, beyond the number of systems the two plans vary greatly.

Terminal Unification

The most notable departure of the new plan from the old is in the commission's proposal that all terminal railways be unified, also its segregation for that purpose of the major terminal railway lines into a group not included in the nineteen railway systems which it would create. Divorcing the trunk-line railways from their own terminal lines is not proposed by the commission, but is indicated as being desirable ultimately.

The commission's proposals are not final nor are they binding upon the railroads, for the transportation act provides that the commission may, upon its own motion or upon application, reopen the subject of changes and modifications.

Proposed Railroad System

The nineteen major systems proposed, with few exceptions, are built up around the same trunk lines which were used as the basis of the tentative plan. The principal lines included in each group are as follows:

System No. 1, Boston & Maine—Boston & Maine; Delaware & Hudson; Bangor & Aroostook; Maine Central and the Rutland line to Ogdensburg.

System No. 2, New Haven—New York,

New Haven & Hartford; New York, Ontario & Western; Lehigh & Hudson and Lehigh & New England.

System No. 3, New York Central—New York Central; Boston & Albany; the Big Four; Michigan Central; Pittsburgh & Lake Erie; Virginian; Rutland (except Ogdensburg line).

System No. 4, Pennsylvania — Pennsylvania; Long Island; part interest in several small strategic lines.

System No. 5, Baltimore & Ohio—Baltimore & Ohio; Reading; Central Railroad of New Jersey; Buffalo & Susquehanna; Chicago & Alton; Buffalo, Rochester & Pittsburgh; half interest in the Detroit, Toledo & Ironton and the Chicago, Indianapolis & Louisville; trackage rights over the Western Maryland.

System No. 6, Chesapeake & Ohio-Nickel Plate—Chesapeake & Ohio (except of Indiana); Hocking Valley; Pere Marquette; Erie; Delaware, Lackawanna & Western; Nickel Plate; Bessemer & Lake Erie; Pittsburgh & Shawmut.

System No. 7, Wabash-Seaboard—Wabash; Lehigh Valley; Wheeling & Lake Erie; Pittsburgh & West Virginia; Western Maryland; Akron, Canton & Youngstown; Toledo, Peoria & Western; Ann Arbor; C. & O. of Indiana; Norfolk & Western; Seaboard Air Line; half interest in D. T. & I.

System No. 8, Atlantic Coast Line—Atlantic Coast Line; Louisville & Nashville; Nashville, Chattanooga & St. Louis; Clinchfield; Atlanta, Birmingham & Coast; New Orleans Great Northern; Gulf, Mobile & Northern; fourth interest in Chicago, Indianapolis & Louisville.

System No. 9, Southern—Southern (except Mobile & Ohio); Norfolk & Southern; Florida East Coast; fourth interest in Chicago, Indianapolis & Louisville.

System No. 10, Illinois Central—Illinois Central; Central of Georgia; Minneapolis & St. Louis; St. Louis Southwestern; Louisville Railway & Navigation.

System No. 11, Chicago & Northwestern—Chicago & Northwestern; Chicago, St. Paul, Minneapolis & Omaha; Chicago & Eastern Illinois; Mobile & Ohio.

System No. 12, Great Northern-Northern Pacific—Great Northern; Northern Pacific; Spokane, Portland & Seattle; Oregon Trunk.

System No. 13, Milwaukee—Chicago, Milwaukee, St. Paul & Pacific; Duluth, Missabe & Northern; Duluth & Iron Range; trackage rights Spokane to Portland.

System No. 14, Burlington—Chicago, Burlington & Quincy; Colorado & Southern; Fort Worth & Denver City; Quincy, Omaha & Kansas City; Missouri-Kansas-Texas.

System No. 15, Union Pacific — Union Pacific; Los Angeles & Salt Lake; Oregon Short Line; Oregon-Washington Railroad & Navigation; Kansas City Southern.

System No. 16, Southern Pacific—Southern Pacific; Nevada-California-Oregon; Texas & New Orleans; Northwestern Pacific; Waco, Beaumont, Trinity & Sabine.

System No. 17, Santa Fe — Atchison, Topeka & Santa Fe; Gulf, Colorado & Santa Fe; Kansas City, Mexico & Orient; Chicago Great Western; Midland Valley.

System No. 18, Missouri Pacific—Missouri Pacific; New Orleans, Texas & Mexico; International-Great Northern; Gulf Coast Lines.

System No. 19, Rock Island-Frisco—Chicago, Rock Island & Pacific; St. Louis-San Francisco; Alabama, Tennessee & Northern; Trinity & Brazos Valley.

System Nos. 20 and 21—Controlled lines of the Canadian Pacific and Canadian National in the United States.

Bids Requested for Grading Work on Mount Vernon Highway

The Bureau of Public Roads has requested bids on the grading, drainage and incidental construction work on the Mount Vernon memorial highway, to include the furnishing of all labor and materials and the performing of all work on approximately 12½ miles of the highway from Columbia Island in the Potomac River just south of Arlington memorial bridge plaza to Mount Vernon. Bids will be opened on Jan. 23. The bridges on the highway will be constructed under separate contract and bids for this work will be requested at an early date. Contracts for paving will not be awarded until the grading is nearing completion.

Unique Sewage-Settling Tanks Put Into Use at East Rochester

New sewage-works for East Rochester, N. Y., put into operation Nov. 16, include a unique type of two-story settling tank. Before the sewage reaches the tank, it passes through a bar screen or trash rack, a grit chamber and a fine screen. The bottoms of the settling chamber and the sludge chamber are parallel and practically flat, and both are swept by sludge scrapers, attached to the same vertical shaft. There is also attached to the same shaft arms which sweep immediately below the bottom of the tray or baffle between the upper and lower chambers. These sweeps work outwardly.

There are also, according to John F. Skinner, of Rochester, N. Y., engineer for the plant, "other novel additions to the usual mechanism for gently agitating the contents of the sludge chamber." Gas produced by sludge digestion in the lower chamber is collected by means of gas domes. The detritor, fine screens and revolving sludge scrapers are of the Dorr type. The tank effluent goes to a trickling filter and thence to a final settling tank. Eventually there will be two tanks and two filters.

The population of East Rochester is about 7,000, and is served mostly by separate sewers.

George B. Waldbridge Appointed Temporary Manager of A.G.C.

Because of the large number of activities on the present program of the Associated General Contractors, the executive committee has requested George B. Waldbridge, vice-president of the Waldbridge-Aldinger Company, of Detroit, Mich., to serve as general manager pro tem until the regular elections are held at the convention in New Orleans on Jan. 20. The position of general manager of the Associated General Contractors was made vacant by the death of D. A. Garber on Dec. 4.

Highway Problems to Be Treated at Road Builders' Meeting

Reports of committee activities make up the greater proportion of the program announced for presentation to the Atlantic City, N. J., meeting of the American Road Builders Association scheduled for Jan. 13-18. Sessions of the city officials' and county officials' divisions will consist exclusively of such reports, the former hearing from six committees and the latter from four. In addition, there will be several joint sessions at which five more committee reports will be heard.

In contrast, the members of the highway contractors' division will hear only one committee report, on liens in public construction, the rest of the division's program consisting of papers on prequalification; on the American contractor in foreign countries, especially Latin America; on airport construction; on credit structure and performance records; and the results of a survey of 48 states on the subject of weather conditions, working days, and bonus and penalty requirements.

Wednesday, Jan. 15, has been designated Pan-American day, and will be opened by a meeting of the Pan-American division, at which addresses will be made by delegates from the several countries. At this session the formal dedication of the Pan-American highway will take place. More detailed consideration of construction problems in the Latin American countries will be given during a second meeting to be held during the afternoon of the same day.

Problems of the manufacturers of construction equipment will occupy the members of the Associated Equipment Distributors during two days, Jan. 12 and 13. Among others, the problems of territorial distribution and credit information will be discussed, and a review will be given of the recent trade practice conference of the concrete mixer and power industry.

Seattle to Erect Building for Light Department

The city of Seattle, Wash., has leased a site, 240x111 ft., upon which it plans to erect a 24-story building for the city light department. Bids from rival groups for such a building will be taken by the city council. One group has offered to spend $2,000,000 on such a structure as a combination substation and general office building, and to turn it over to the city, debt free, in 50 years. In the meantime, the city light department will have the use of the basement and sub-basement, and parts of the upper floors for office and substation use. The lease cannot be negotiated without the sanction of the voters. Bids for the structure will be opened by the city council on Jan. 9. The building will cost not less than $1,500,000.

Final Stretch of Trans-Canada Highway to Be Cleared

Contracts have been let by the Manitoba government for the work of clearing the final stretch in Manitoba on the Trans-Canada highway, according to a report made public by the U. S. Department of Commerce. The last unopened stretch is a distance of about 44 miles from Whitemouth to the Ontario boundary through brush country. The right-of-way will be cleared 99 ft. wide. The cost of finally completing the 44-mile extension into an all-weather graveled highway is estimated at about $550,000, and at the last session of the Manitoba legislature a sum of $200,000 was appropriated for this year's program. With similar operations being conducted by the Ontario government from Kenora to the Ontario boundary, officials of the Manitoba Department of Highways expect the Trans-Canada highway to be completed to Kenora by the fall of 1930.

Texas District Sells $6,600,000 Irrigation Bonds

Announcement has been made of the sale of $6,600,000 of bonds of the Maverick County (Tex.) Irrigation District No. 1 at a price of 90 plus accrued interest. The contract for constructing the irrigation system has been awarded to Ulen & Company, New York City, the work to begin in January. Of the total issue of bonds, $4,800,000 will be used for constructing the canals, ditches and other features of the irrigation system, and $1,800,000 for constructing a hydro-electric plant. Water will be obtained from the Rio Grande and will be used to irrigate 100,000 acres of land in the valley of the international boundary stream. The electric power will be sold by the district to the Central Light & Power Company, which already has an extensive power transmission system in this part of the border.

Another Texas irrigation project which provides for the reclamation of 69,364 acres of land in the Lower Rio Grande Valley will be placed under construction as soon as the state Board of Water Engineers approves the application for appropriating water from the Rio Grande and other details connected with the plans. The tract, which is embraced in the Hidalgo County Water Control and Improvement District No. 12, which has just been organized, is situated in the northwestern part of Hidalgo County. Tentative plans for the project include a concrete-lined canal, large water-storage reservoirs and a pumping plant at the intake at the Rio Grande. The total cost will be approximately $4,000,000, which will be met by a bond issue.

Seattle Considering Bridge or Vehicular Tunnel

Application to the city council of Seattle, Wash., for a franchise to build a traffic tube with 24-ft. roadway on the bed of Lake Washington between the Seattle mainland at Seward Park and Mercer Island has been made by A. J. Gilardi and C. A. Newhall, engineers for the Traffic Tube Construction Company, who estimate the cost of carrying out the project as approximately $4,500,000. Water depth off Mercer Island is 150 ft. The council also has under consideration the long-debated Mercer Island toll bridge plans of the Puget Sound Bridge & Dredging Company. This plan has not been favored by the council, because of opposition of the park board to any surface approach being built either through or around the rim of the park.

Edison Medal Awarded to Prof. C. F. Scott

The Edison medal of the American Institute of Electrical Engineers has been awarded to Prof. Charles F. Scott, of Yale University, "for his contributions to the science and art of polyphase transmission of electrical energy."

Accomplishments and Plans of the Chicago Sanitary District

Sewage-Works Construction Up to Requirement —Operation Lags— Future Program Outlined

(Special Correspondence)

ALL the conditions required of the Sanitary District of Chicago by the terms of the permit issued by the Secretary of War to divert 8,500 sec.-ft. of water from Lake Michigan during the five years ending Dec. 31, 1929, have been complied with. A summary of these conditions has double interest in view of the decree by the United States Supreme Court recommended by Charles E. Hughes, printed on p. 983 of *Engineering News-Record*, Dec. 19, 1929.

The permit required the construction of sewage-works by Dec. 31, 1929, sufficient to provide the equivalent of the complete (100 per cent) treatment of the sewage of a human population of at least 1,200,000. The district authorities report accomplishment up to the equivalent of 1,400,000 human population—but as stated further on all the works built are not in full operation. A bond of $1,000,000 guaranteeing payment by the district of its share of the cost of lake-level regulation or compensation works has been posted.

Plans for works to prevent the discharge of the Chicago River into Lake Michigan during heavy storms were submitted to the Chief of Engineers and the Secretary of War in November, 1927, but, not having been acted on, the works were not ready for use on July 1, 1929, as the permit required.

City Installing Meters

The permit was revocable if, within six months of its date, the city of Chicago did not adopt a plan for metering at least 90 per cent of its "water service" (exact meaning not defined) and provide for executing the plan at an average rate of 10 per cent a year thereafter. During 1929, the city installed 13,000 meters, bringing the total to 80,000, or 20 per cent of the number ultimately required, but these meters pass about one-third of the total consumption, which averages 1,500 sec.-ft., or a billion gallons daily. The actual annual diversion from Lake Michigan has not exceeded the 8,500 sec.-ft. allowed by the permit.

The proposed court decree requires the district to complete by Dec. 31, 1938, a sewage-works construction program for the treatment of the entire sewage and industrial wastes of the district. Already what are known as the Northbrook, Glenview, Morton Grove and Des Plaines River plants, all small, are in use; the Calumet plant, much larger, is also in use, but must be extended, the proposed decree says, by Dec. 31, 1933. The huge North Side plant (activated-sludge) was started up over a year ago, but has been run at only a third capacity because of the financial stringency of the district and the shutdown of construction on the North Branch pumping station, which will bring in the flow of one-fourth of the population tributary to the plant. Early in January, 1930, it is proposed to operate the North Side sewage-works as completely as possible without the pumping station and it is hoped that the station will be in use early in the summer of 1930. The proposed decree calls for full operation by July 1, 1930.

Battery A of the Imhoff tanks comprising the large West Side plant is nearly completed. It is expected that sewage will be pumped through these works early in January, 1930, and that Battery B will be finished in the following spring. The proposed decree calls for the completion of these two batteries by July 1, 1930, and for completion of the whole plant by Dec. 31, 1935. The third of the large plants, the Southwest Side, should be completed by Dec. 31, 1938, the proposed decree says, thus completing the construction program.

The bare construction costs of treatment works to Oct. 1, 1929, have been $90,000,000, of which $57,000,000 has been spent with the five-year period of the permit.

Lamont Committee Reports on Uniform Traffiic Regulation

Experience to date with the uniform traffic regulations proposed by the Hoover National Conference on Street and Highway Safety, together with possible revisions, were the topics discussed by 75 interested persons at a meeting held in Washington, D. C., Dec. 16 and 17 under the sponsorship of R. P. Lamont, Secretary of Commerce. In general, experience indicates that both the Uniform Vehicle Code, available since August, 1926, and the Model Municipal Traffic Ordinance, available in August, 1928, are basically sound and warrant general adoption. However, a small technical drafting committee was authorized to make an appendix to the code for the guidance of those states that can adopt more detailed regulations applicable within municipalities. These regulations are to be rewritten so as to meet rural conditions. In addition, the committee is to redraft certain wording to make it more specific and understandable. A very few definite instructions of alternates and minor charges were authorized, such as making automobile tail lights red and the tail signal lights yellow. Reports of any changes the drafting committee may make are to be submitted at a later meeting of the regulation committee in time to be reviewed and discussed before a proposed spring meeting of the National Conference.

Progress toward uniformity may be summarized as follows: Legislation based on the Uniform Code has been enacted in 23 states, with twelve states using one or more of the four acts of the code in toto. The Municipal Traffic Ordinance has been adopted, substantially as recommended, in Indianapolis, Providence and a dozen additional cities.

New ordinances of the following cities are based in part on the model ordinance: Chicago, Boston, San Francisco, Los Angeles and a number of smaller cities. New Jersey and Wisconsin have incorporated in their state laws practically all of the model ordinance except the details of local parking. Both California and Michigan have been successful in securing substantial uniformity in municipal regulations. Conflicting and widely diverse regulations still exist in many states with reference to speed limits, passing street cars, entering through highways, turning at intersections, pedestrian regulation, rights-of-way rules and hand-and-arm signals. All of these matters will be given thorough consideration by the drafting committee.

At the meeting a special committee was authorized to study right-of-way and other intersection factors under varying conditions. A request was made that functional standards and specifications be worked out after research by the American Engineering Council if that body could revive the committee which reported on street traffic signs, signals and markings. As to signs, a definition of the use of the "slow" sign and its possible use where the "stop" sign is now used at the less-traveled intersections is to be studied more in detail. An intensive educational campaign for enactment of uniform regulations, with literature prepared in Washington but generally directed in detail by local interests, was authorized.

"Lexington" Supplies Power

(Continued from page 1022)

dition, it is planned to divert the flow of the other fork of the Skykomish River into Lake Cushman and so increase the inflow.

Under the operation of Tacoma's system in normal years the Cushman reservoir will fill during the wet seasons and will be drawn down during the dry. The last time the lake was full and spilling was Jan. 1, 1928. At the present time (Dec. 14) out of a possible 135 ft. of draw-down there are 31 ft., or 7,000,000 kw.-hr., left. Recent rains have brought the flow of the Nisqually River practically to normal, so that the plant on that river can carry its full load of 24,000 kw. This is sufficient to carry the night load; therefore if sufficient additional power can be obtained for the day load, now averaging 40,000 to 45,000 kw., the Cushman plant can be shut down entirely for a time, permitting the storage reservoir behind it to fill up to a point where sufficient storage may be secured against another low-water period expected during the freezing weather of January and February. Thus it is expected that the 20,000 kw. from the "Lexington" can be absorbed into the system from 7 a.m. to 8 or 9 p.m. and that available steam plus possible assistance from the city of Seattle or from the Puget Sound Power & Light Company will carry the short peaks extending above the average flat day-load curve.

WASHINGTON NOTES

By Paul Wooton
Washington Correspondent

Railway Consolidation Plan Favorably Received — Flood Control Projects Under Study

THE CONSENSUS of opinion in Washington is that the Interstate Commerce Commission's railroad consolidation plan will promote unification of the carriers. Having resisted for nine years the instruction of the transportation act of 1920 to prepare such a plan on the ground that it would tend to retard rather than accelerate consolidation, it is plainly evident that the commission has made an attempt to meet the desires of the railroads themselves. The plan improves the prospects for working out the proposals submitted beforehand by several of the carriers and the prediction frequently was made this week that it has paved the way for many new applications for the consolidation of railroad properties. On the whole, the plan is regarded as a definite step toward accomplishing the objects individually sought by the various systems.

The adeptness of the commission in the allocation of contested lines has created a feeling among the railroad merger makers that is closely akin to admiration. This does not mean that many of the commission's proposals will not be vigorously fought, but simply that, in the main, the systems mapped out by the commission will encourage rather than impede consolidation. The sentiment that the plan will serve as a good working basis for negotiotion in ensuing months and years is very generally shared.

The outstanding feature of the plan is the tendency to disregard what have heretofore been accepted by the railroads themselves as their natural territorial limits. This is well illustrated by the remarkable extent of the proposed fifth system in Eastern territory, made by linking the Wabash and the Seaboard. The Wabash is the only system now bridging both the Missouri and Mississippi rivers, and by tying up with the Seaboard its lines would extend all the way down into Florida. Similar evidence of this tendency on the part of the commission to project well-defined railroad systems into wholly new territory is presented in the allocation to the Chicago & Northwestern of the Chicago & Eastern Illinois and the Mobile & Ohio, which would bring this system down to the Gulf.

The Business Outlook

Industrial activity and general trade are running below last year, but the contraction in industrial activity seems so far to have been more marked than that in retail trade. The last two weeks of the year are usually a very slack period in most basic industries, because of year-end shutdowns for inventory purposes. Easier money conditions are apparently spreading somewhat into the interior, which will be helpful if the smaller country banks respond by availing themselves of more abundant credit which Federal Reserve policy is making possible. Steel mill operations were sustained on practically a constant level last week, the average for the industry holding at 64 per cent of capacity as compared with 80 per cent a year ago.

—The Business Week, Dec. 25.

Florida Flood Control

At the initial meeting of the House flood-control committee it was decided that because of the urgent condition that exists in the Lake Okeechobee district in Florida, legislation should be taken up as soon as possible with the view to affording relief. Chairman Reid stated that he has introduced a bill adopting the project recommended by the Chief of Engineers last January. This project consists of providing a channel 6 ft. deep and at least 80 ft. wide in the Caloosahatchee River at an estimated cost of $1,557,000; a channel 6 ft. deep and 60 ft. wide in Taylors Creek at an estimated cost of $58,000; and levees 31 ft. high around Lake Okeechobee at an estimated cost of $9,100,000. As to the amount authorized to be appropriated, Mr. Reid explained that his bill leaves this blank so that the proper proportion of the expense to be borne by the federal government can be worked out during the hearings that will be held next month.

Mississippi Changes Await Report

In regard to the Mississippi project, it has been decided to take no action on the various bills designed to amend the adopted plan until the report of the Chief of Engineers is submitted relative to certain resurveys in the lower valley. It is expected that this report will be transmitted to the committee during the latter part of January. Mr. Reid believes, however, that the court decision sustaining the contention of the property owners in the Bouef and Atchafalaya basins will delay the report. He bases this opinion on the fact that the army engineers have been predicating their plans on the assumption that there was no particular reason for confining the water diverted through the floodways. Now that the courts have held that payment must be made for the land used, he believes that it is reasonable to conclude that the engineers will modify their plans so as to provide for a controlled floodway that will require a minimum amount of land.

While not informed as to the exact details of the plans recently drafted by Harry Jacobs, chief state engineer of Louisiana, Chairman Frank Reid of the House flood-control committee has stated that these proposals seem to con-

tain considerable merit. Mr. Reid is particularly impressed with the recommendations for storage reservoirs that are outlined in the Jacobs plan. In this connection he called attention to the fact that he has long championed the utilization of reservoirs to hold back the floodwaters. As to the passage of more water through the Bonnet Carré spillway, which is contemplated by the Jacobs plan, Mr. Reid stated that he is open minded. The main thing is to provide some place for the excess water to go, he said. He added that it would be a matter for the engineers to work out as to whether or not additional water can be diverted through the Bonnet Carré spillway. The protection of New Orleans is the prime requisite of all flood-control plans, he pointed out.

More Federal Aid Advocated

Hearings on highway legislation began Dec. 16 before the roads committee of the House of Representatives. All witnesses that have appeared thus far are unanimous in their belief that the appropriation should be increased from $75,000,000 to $125,000,000 yearly. It is advocated in addition that $25,000,000 be made available immediately upon the passage of the bill. The initial presentation before the committee was made by W. C. Markham, the Washington representative of the American Association of State Highway Officials. Samuel Eckels, chief engineer of the Pennsylvania Highway Commission, in the course of testimony before the committee presented statistical tables showing that the federal government is not keeping pace with the states in the matter of road building. In fact, only 9½ per cent of total expenditures last year came from the federal treasury. There were 78,000 miles of federal-aid highway built, but in addition to that the states built on their own account 81,000 miles. The average of federal aid was $9,000 a mile. Had the United States contributed to all roads built in the country last year, the federal-aid portion of the expense would have been $728,000,000.

Railroad Valuation Reopened

To determine how to give effect to the decision of the U. S. Supreme Court directing that some consideration must be given to replacement costs in valuing the railroad properties for rate-making purposes, the Interstate Commerce Commission has reopened the famous St. Louis & O'Fallon railway case for further argument on Jan. 23. Already complex, the Supreme Court's decision renders the task of railroad valuation still more complicated because the court's decision did not specify how much weight shall be given to the factor of reproduction cost. Besides having to decide how much shall be added, the commission has also to determine how to figure the increase: whether by applying an index number to the 1914 base or by repricing each and every item comprising common carrier property.

Personal Notes

ROBERT J. TORRENS on Jan. 1 will open an office in the Shubert Building, St. Paul, Minn., as a consulting engineer, specializing in steam and electric projects.

BERNARD R. FULLER, formerly connected with the Power Corporation of New York as estimating engineer at Watertown, N. Y., has assumed similar duties with the Trojan Engineering Corporation, New York City.

RAY M. HUDSON, assistant director of the National Bureau of Standards, in charge of commercial standardization, has resigned, effective Jan. 1, and will become secretary of the Massachusetts division of the New England Council, with headquarters in Boston.

CLIFTON H. LUSTER, of Hillside Township, N. J., has resigned as township engineer. Mr. Luster has been connected with the engineering department of the township since 1913, and succeeded his father as township engineer in 1924.

HUGH A. BROWN has been appointed director of reclamation economics in the U. S. Bureau of Reclamation by the Secretary of the Interior, to fill the vacancy created by the death of George C. Kreutzer. Mr. Brown has been with the Bureau of Reclamation since 1912 and has been assistant to Mr. Kreutzer for the past five years.

JOSEPH B. SHAW, for the past two years connected with the National Brick Manufacturers Association as engineer, has been appointed city engineer of Utica, N. Y., effective Jan. 1, succeeding Richard S. Cookingham. Mr. Shaw formerly served four years as assistant city engineer.

DUDLEY JONES, of Oklahoma City, Okla., who formerly served as division engineer and assistant highway engineer in the Oklahoma state highway department, has been made division engineer of the Tulsa district, succeeding CHARLES L. WILSON, who has been promoted.

Obituary

AURIN B. NICHOLS, of Philadelphia, Pa., who was one of the engineers in charge of survey for the proposed Nicaraguan Canal and who later took part in the construction of the Panama Canal, died on Dec. 15 in his 85th year.

WILLIAM PATON THOMPSON, of New York, died on Dec. 21 in an Atlantic City hospital after an illness of several months. Mr. Thompson, who was 57 years old, had been identified with railroad engineering, devoting most of his time to track problems. He was vice-president of the Rail Joint Company, of New York.

LLOYD SCHWARTZ, district engineer of the Illinois Division of Highways, was drowned in the Mississippi River near Cairo, Ill., on Nov. 7. Mr. Schwartz was born at Golden, Ill., in 1889. He was graduated from the University of Illinois in 1911, and after serving one year as an instructor at that institution, entered the service of the Illinois State Highway Division. Shortly after returning from military service at the end of the World War in 1919, Mr. Schwartz was appointed district engineer, with offices at Carbondale, Ill., having charge of all highway activities of the department in fourteen counties of southern Illinois.

CHESTER M. KENDALL, assistant engineer in charge of the division of stations for the New York Board of Transportation, which is building the city's new subway system, died Dec. 18. He was 45 years old. After his graduation from Worcester Polytechnic Institute he was with the American Bridge Company until he was appointed in 1913 to the old Public Service Commission of New York as a junior engineer. He thereafter rose progressively through the ranks of the Public Service Commission, the Transit Commission, the Transit Construction Commission and the Board of Transportation to the post of first assistant engineer in charge of the finishing of subway stations.

Society Calendar

AMERICAN CONCRETE INSTITUTE, Detroit; annual convention, New Orleans, La., Feb. 11-13.

AMERICAN RAILWAY ENGINEERING ASSOCIATION, Chicago; annual meeting, Chicago, Ill., March 11-13.

AMERICAN ROAD BUILDERS ASSOCIATION, Washington; annual convention, Atlantic City, N. J., Jan. 11-18.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; annual meeting, New York City, Jan. 15-17.

AMERICAN WOOD PRESERVERS ASSOCIATION, Chicago; annual meeting, Seattle, Wash., Jan. 28-30.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, Washington; annual convention, New Orleans, La., Jan. 20-22.

ASSOCIATION OF HIGHWAY OFFICIALS OF NORTH ATLANTIC STATES, Trenton; annual convention, Syracuse, N. Y., Feb. 19-21.

ENGINEERING INSTITUTE OF CANADA, Montreal; annual convention, Ottawa, Ont., Feb. 12-14.

NATIONAL CRUSHED STONE ASSOCIATION, Washington; annual convention, Cincinnati, Ohio, Jan. 20-23.

NATIONAL SAND AND GRAVEL ASSOCIATION, Washington; annual meeting, Memphis, Tenn., Jan. 28-30.

ILLINOIS SECTION, American Society of Civil Engineers, on Dec. 16 elected the following officers: president, Charles A. Morse; vice-president, Walter A. Rogers; secretary, W. G. Zimmermann.

NORTHWEST BRANCH, Associated General Contractors, will hold its eleventh annual convention Jan. 6-8 at Minneapolis.

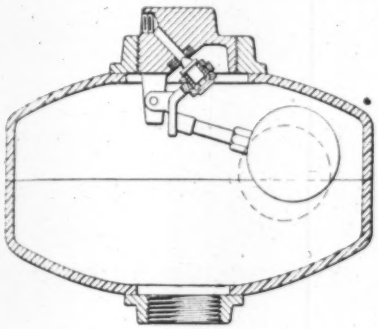
SAN FRANCISCO SECTION, American Society of Civil Engineers, on Dec. 17 elected officers for 1930 as follows: president, Henry D. Dewell, consulting engineer; vice-presidents, L. B. Reynolds, professor of hydraulics and sanitary engineering, Stanford University, and George W. Pracy, superintendent, Spring Valley Water Company.

SOUTH DAKOTA SOCIETY OF ENGINEERS AND ARCHITECTS and SOUTH DAKOTA CONTRACTORS' ASSOCIATION will hold a joint annual convention Jan. 15-16 at Rapid City.

Construction Equipment and Materials

Automatic Air Relief Valves for Varying Pressures

Valves which will discharge automatically accumulations of air from pipe lines, pumps and various kinds of tanks are being manufactured in three types by the Automatic Primer Company, Chicago, Ill. These pass air both in and out, but will close at once on liquids. By inserting a vacuum ball in the head of the valve, air will be passed in one direction only. The smallest valve, made in ⅜-, ¾, and 1-in. sizes, is good for pressures up to 125 lb. per sq.in., with venting capacities of as high as 20 cu.ft. per minute at 60-lb. pressure. When larger amounts of air are to be evacuated, a second type of valve, actuated by a float, is recommended. On account of the size of the valve chamber this valve also serves as an air accumulator. It can be used under pressure conditions not exceeding 200 lb. per sq.in. For higher pressures, a third series is produced which will withstand pressure as high as 500 lb. per sq.in. This is made in 1½-in. size only.



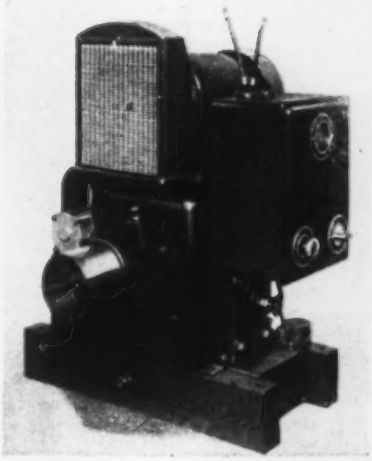
AIR RELIEF VALVE WITH LARGE CHAMBER

Metallic Aggregate Hardens Concrete

Unusual hardness, wear resistance and impenetrability to moisture and oil are claimed for a metallic aggregate known as Betonac, which has been introduced into this country from abroad by the American Betonac Corporation, New York City. The material is made in three grades which may be used separately or in combination to obtain surfaces of different characteristics. To secure a smooth texture throughout, the coarsest grade is used, consisting of particles about the size of wheat grains. The fine grade is used where unusual waterproofing efficiency is desired, and the medium grade is mixed with either of the two others to secure a non-slip surface. In mixing, the maximum strength is secured by taking equal parts, dry measure, of Betonac and portland cement. This can be applied to green concrete foundations as a top dressing, or to old concrete wherever a concrete surface finish would adhere. For some purposes, Betonac can be diluted with sand up to a maximum of 50 per cent sand content. The ingredients are thoroughly mixed dry before water is added in sufficient quantities to obtain the consistency desired. When desired, Betonac can be used in combination with coloring materials or with quick-setting cement.

Self-Contained Unit Lights Isolated Jobs

To meet the demand on the part of contractors for a dependable source of electricity for night illumination, Fairbanks, Morse & Company, Chicago, Ill., have developed a compact, self-contained light plant consisting of power unit, ignition system, generator and control mechanism mounted as separate units on a single base. The engine used is the F-M self-oiling model C engine with high-tension magneto. Two sizes are available: a 1½-hp. gasoline unit generating 750 watts and a larger 3-hp. engine burning either gasoline or kerosene, which generates 1,500 watts. The ball-bearing generator is mounted directly above the engine and is driven by a Flex-mor V belt. The control box, mounted on the frame, consists simply of a pushbutton starter and a "high-low-belt" switch which permits the storage battery to be charged at rapid or low rates. In the belt position the generator is electrically disconnected from the engine, so that the entire power output is available for mechanical work from a pulley on the end shaft. The storage battery plant starts with a simple pushbutton control, the generator acting as a motor during the starting period. Either size of plant can also be operated without storage battery, in which case a special control panel is provided on which is mounted a voltmeter, an ammeter and a field rheostat which permits of voltage regulation to meet various load demands. Battery units can be so arranged as to provide either 32- or 115-volt circuits. The motor is water cooled by means of a radiator and fan, the same system also providing for the generator cooling.



MOTOR-GENERATOR LIGHTING UNIT

Asphalt Plant Designed for Easy Transportation

By redesigning its standard 1,000-lb. asphalt plant, the Madson Iron Works, Huntington Park, Calif., has produced a unit which can, it is claimed, be profitably set up for a ten- or fifteen-day run. Although designed to handle 1,000-lb. batches at intervals of about 1¼ minutes, the plant is capable of mixing batches up to a maximum of 1,500 lb. each by weighing off twice to each mix. In order to avoid loading beyond legal limits the plant is built in two units, with a separate trailer on which are mounted a 25-hp. steam boiler, a 10-ton steam-heated asphalt tank, a 200-gal. water tank, a 400-gal. fuel tank and pumps for asphalt, fuel and boiler feed. Disposition of weight and bulk permits the individual units to be larger and

TRANSPORTING ASPHALT PLANT TO NEW LOCATION

of greater capacity and at the same time more accessible for operation and maintenance.

Power for driving the plant can be furnished either by electric motor or by gas, gasoline or oil engines. A 50-hp. motor is standard equipment, but the outer end of the main shaft is extended to accommodate a belt pulley for driving by a 75-hp. engine when electricity is not available. Loss of heat to the outside air is reduced to a minimum by mounting the screen for heating sand and stone directly above the drier periphery and inclosing the dual unit immediately above the sand bin with an insulated screen cover. Stone and sand bins provide a volume of not less than seven mixer loads. For handling cold and moist materials, the elevator is not inclosed. The unit is a self-contained assembly, transportable as a whole or in two parts. It is built on a channel framework. The elevator frame is jointed in the middle half, thus requiring removal of the lower half only when moving to a new location.

Kerosene Torch Preheats Metal for Welding

When welding heavy pieces with the oxyacetylene torch it is usually advisable to preheat the section in order to eliminate the warping or cracking which would otherwise occur if a cold weld

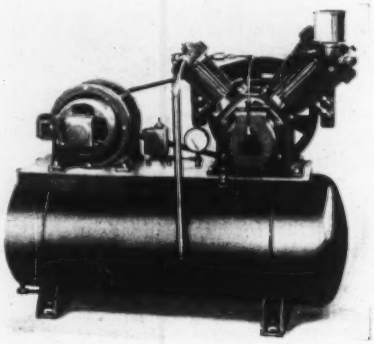
KEROSENE TORCH AND SUPPLY TANK

were attempted. Preheating also improves the quality of the weld and saves oxygen and acetylene. For this purpose the St. Paul Welding & Manufacturing Company, St. Paul, Minn., has put on the market a portable kerosene torch known as the Torit 8-K which throws a flame about 2 ft. long. Fuel is supplied to the torch by a 10-gal. tank through 10 ft. of oil hose. By equipping the tank with a double-acting pump provision has been made for refilling while the torch continues to operate.

Besides its use in welding, this outfit can also be adapted to other purposes wherever a large, hot flame is desired such as, for example, for melting lead out of pipe joints, thawing or drying sand, gravel and other materials, and for melting snow and ice.

Two-Stage Compressor Unit Cooled by Air

Self-contained two-stage air-cooled air compressor units of the type known as 30 are now being produced in four sizes by the Ingersoll-Rand Company, New York City. All four models are built for working pressures up to 200 lb. per sq.in. continuous duty, and are equipped with electric motors varying in size from ¾ to 5 hp. connected to the compressors by U-belts. Both motor and compressor are mounted on a steel base which is attached to the top of an air receiver of heavy pressed steel. Thus no special foundation is required, and the compressor is ready to operate as soon as

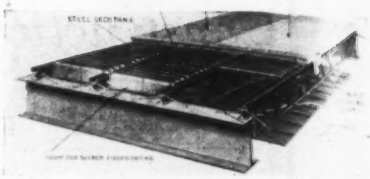


TWO-STAGE COMPRESSOR UNIT WITH ELECTRIC DRIVE

electrical connections to the motor have been made and the crankcase is filled with oil. Automatic stop and start control is provided which prevents the compressor from starting against a load by automatically releasing air in the high-pressure cylinder and intercooler when the motor is shut off for any reason. The intercooler is located behind the fan-type flywheel. Vibration is reduced by a balanced crankshaft, and a self-cleaning air cleaner keeps dirt out of the compressor.

Light-Weight Floor Constructed of Steel and Concrete

Elimination of unnecessary dead weight is the objective of a new type of steel deck floor construction developed by the Rivet-Grip Steel Company, Cleveland, Ohio. Besides its light weight, this design also has the advantage of exceptional rigidity. Component parts include a welded steel joist made up with a channel for the top chord, a tee for the bottom chord, and heavy webbing welded into place to connect the two; ribbed, solid plate steel decking interlocking with the top chord channels of the steel joists; and special bridging forms and fireproofing forms. In building the floor, the joists are first placed in accordance with the usual practice. The steel deck pans are laid with their hooked ends turned down into the trough of the joist channels and are wired into place. At the center



COMPONENT PARTS OF STEEL AND CONCRETE FLOOR

of each floor panel bridging forms of heavy gage metal are hung from the deck pans. The panel ends are then closed by fireproofing forms. This assembly produces a solid interlocked steel deck which forms a satisfactory flooring for the mechanical trades and upon which concrete or terrazzo can be cast without sag or dripping of cement mortar.

Business Notes

HUNTER MACHINERY COMPANY, Milwaukee, Wis., has purchased the Ward Equipment Company of Pittsburgh, Pa., and is planning to enlarge facilities at its plant. Harry Ward will continue as vice-president in charge of machinery sales and D. J. Conway as vice-president and general manager.

PIONEER SAND & GRAVEL COMPANY, of Seattle, Wash., has purchased the George Scofield Company, a building material firm of Tacoma.

WALKER-CRAVENS COMPANY AND BARRETT-CRAVENS COMPANY, of Chicago, Ill., and AUTOMATIC TRANSPORTATION COMPANY, Buffalo, N. Y., have consolidated.

DONALD B. MACNEAL, Chicago, Ill., will on Jan. 1 take possession of a new storage yard in that city at which it will store equipment offered for sale. Space is also available for the storage of equipment for contractors.

CHARLES PIEZ, chairman of the board of the Link-Belt Company, has begun his term as president of the American Society of Mechanical Engineers.

Costs and Contracts

E. N.-R. Index Numbers

Cost		Volume	
Dec. 1, 1929	**209.46**	**November, 1929**	**245**
Nov. 1, 1929	208.46	October, 1929	273
Dec. 1, 1928	210.16	November, 1928	251
Average, 1928	206.78	Average, 1928	287
Average, 1927	206.24	Average, 1927	263
1913	100.00	1913	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Dec. 26, with some comparisons, total as follows:

(In Thousands of Dollars)

	Dec. 26, 1929	Dec. 19, 1929	Dec. 27, 1928
Buildings:			
Industrial	$2,272	$4,582	$8,167
Commercial	8,606	24,410	33,100
Streets and roads	6,582	5,793	4,593
Other eng. constr.	4,165	14,056	9,677
Total	$21,625	$48,841	$55,537
Total, all classes, Jan. 1 to Dec. 26:			
1929			$3,953,203
1928			3,578,580

DEC 28 1929

Engineering News-Record

Devoted to Civil Engineering and Contracting. McGraw-Hill Publishing Company, Inc.

December 26, 1929

Design and Construction of Big Dalton Dam

Tests of Large Columns of Three Grades of Structural Steel

Proposed Activated-Sludge Plant for New York City

Shunt System of Operating Filtered-Water Reservoirs

Water-Tamping of Fills on Texas Highway Work

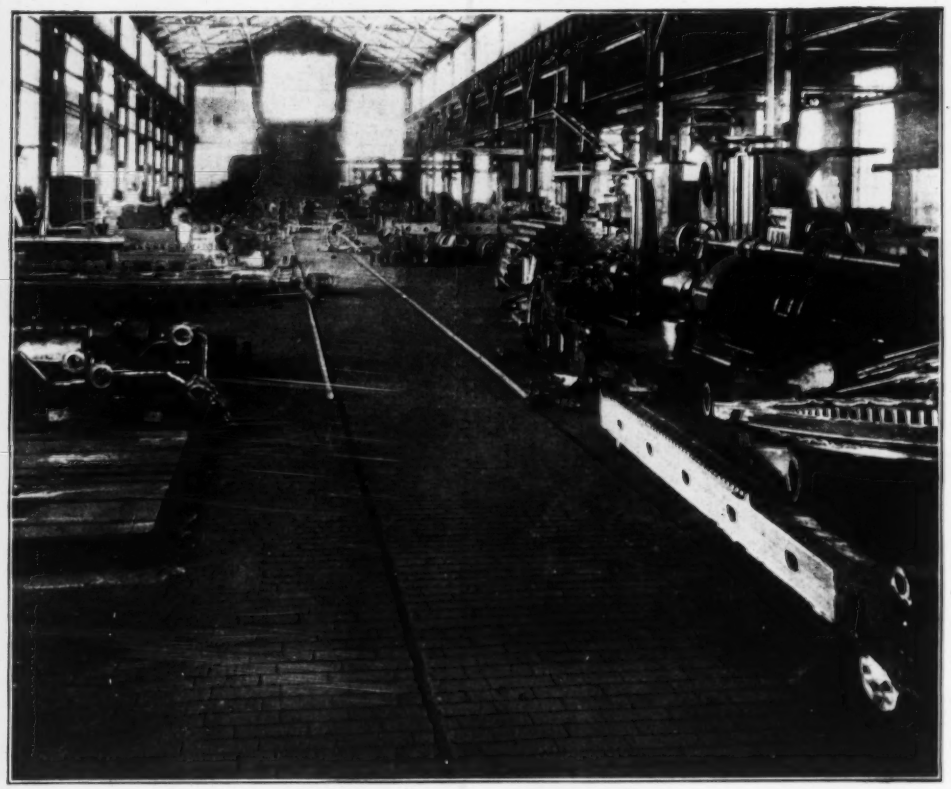
Largest Underwater Tunnel Under Construction in England

Electric Equipment for Operating Doors of Airship Dock

Big Dalton Dam
Los Angeles Flood Control District

KREOLITE

"Outlast the Factory"



WHEN A RAILROAD LOCOMOTIVE RUNS OFF THE TRACK

Any other floor would have crumbled and gone to pieces under the terrific shock and weight of a railroad engine.

This illustration is made from an actual photograph of what happened in this plant. Notice the groove in the floor made by the wheels of the locomotive after it left the track without injuring in any way the balance of the floor.

This is just one instance where Kreolite Wood Block Floors laid with the tough end-grain up have proved our claim that they insure you the maximum of strength, endurance and economy. Our Kreolite Engineers will study your needs without any obligation on your part.

Kreolite Floors can be laid without interrupting production.

THE JENNISON-WRIGHT COMPANY, TOLEDO, OHIO

Branches in All Large Cities

WOOD BLOCK FLOORS

ENGINEERING NEWS-RECORD. December 26, 1929. Vol. 103, No. 26. Published weekly. McGraw-Hill Publishing Company, Inc., Tenth Avenue at Thirty-sixth Street, New York, N. Y. $5 per year. 25 cents per copy. Entered as second-class matter, April 11, 1917, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Seven Contracts for the "57 Varieties"

Among our numerous clients we "point with pride" to the great H. J. Heinz Co. of Pittsburgh, Pa. The sum total of all the piles we have driven at this plant in seven contracts amounts to 7,150—as follows:

1. Job J-307. POWER HOUSE, 1913, 1,402 piles averaging 22 ft. long. George Bippus, Architect. Hunting, Davis & Dunnells, Consulting Engineers.
2. Job 190. BAKED BEAN BLDG., 1912. 503 piles averaging 25 ft. long. George Bippus, Architect.
3. Job 1772. CEREAL BLDG., 1926. 1,511—23-ft. piles. Albert Kahn, Inc., Architects.
4. Jobs 254 and 365. SHIPPING BLDG., 1913, 1914. 911—21 ft. piles. 983—27 ft. piles. George Bippus, Architect.
5. Job 1060. SPAGHETTI BLDG., 1922. 845—25-ft. piles. R. Maurice Trimble, Architect.
6. SITE OF PROPOSED AUDITORIUM BLDG. Approximately 1,001 piles, averaging 26 ft. 3 in. long. Albert Kahn, Inc., Architect.
(In background, Buildings on opposite page).

The contracts so placed by Heinz are typical of work being done by this Organization for other large companies as well as for individual Architects, Engineers and Builders throughout the country. Every pile poured into a spirally reinforced steel shell and every shell left in the ground.

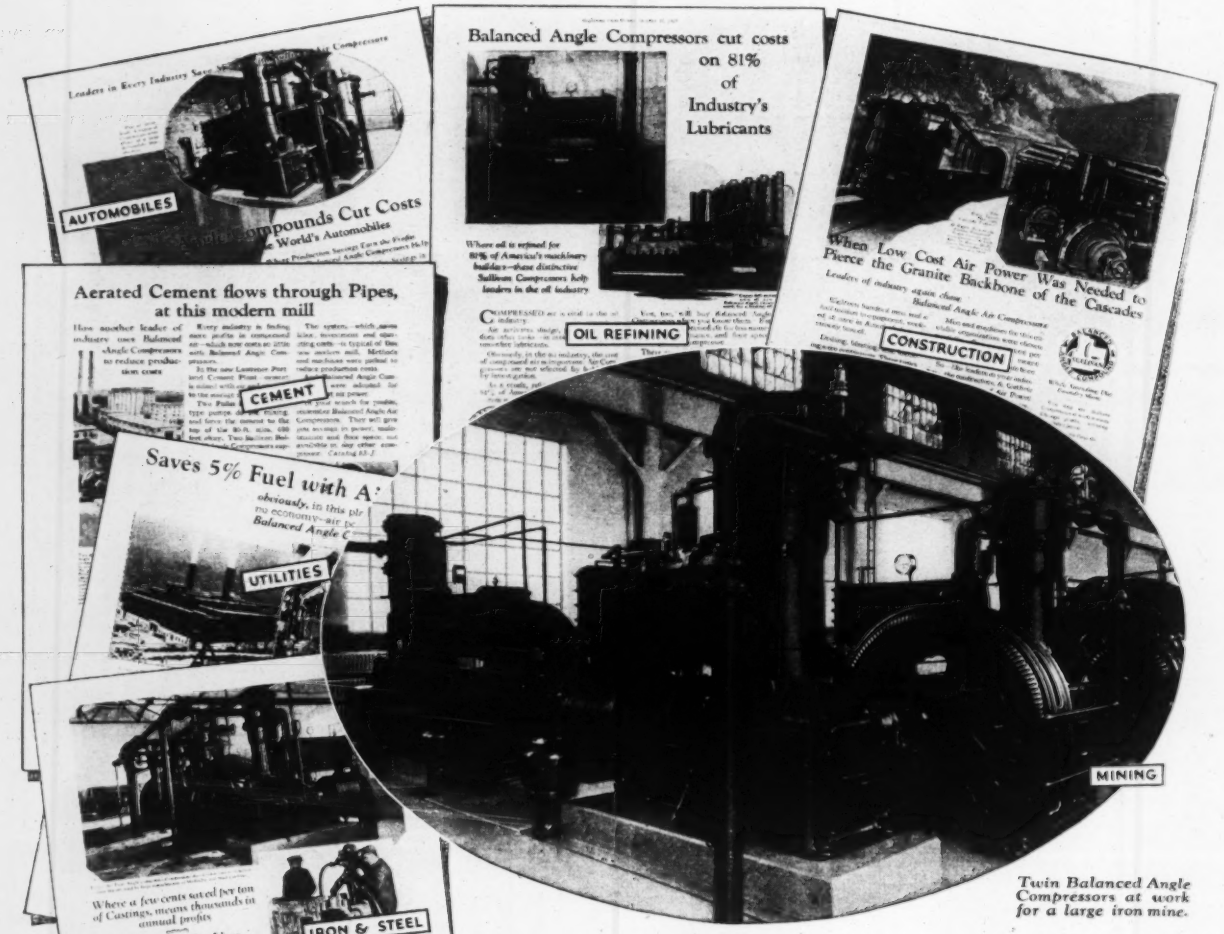
RAYMOND CONCRETE PILE COMPANY

NEW YORK: 140 Cedar Street CHICAGO: 111 West Monroe Street

Raymond Concrete Pile Co. Ltd., Montreal, Canada

ATLANTA	CHICAGO	KANSAS CITY	PHILADELPHIA	ST. LOUIS
BALTIMORE	CLEVELAND	LOS ANGELES	PITTSBURGH	ST. PAUL
BOSTON	DETROIT	MIAMI	PORTLAND	WASHINGTON
BUFFALO	HOUSTON	MILWAUKEE	SAN FRANCISCO	LONDON, ENGLAND

Raymond


AUTOMOBILES
Balanced Angle Compressors cut costs on 81% of Industry's Lubricants
OIL REFINING
When Low Cost Air Power Was Needed to Pierce the Granite Backbone of the Cascades
CONSTRUCTION
Aerated Cement flows through Pipes, at this modern mill
CEMENT
Saves 5% Fuel with A
UTILITIES
MINING
A Great Foundry Uses Balanced Angle Compressors
IRON & STEEL
ELECTRICAL
air power cuts the cost, and electricity serves new mill
LUMBERING
where Air earns
BALANCED ANGLE COMPOUND
SULLIVAN

Twin Balanced Angle Compressors at work for a large iron mine.

Send for portfolio of advertisements showing Balanced Angle Compressors, in plants of industry's leaders.

Big Business Adopts Balanced Angle Compressors

Big business is setting a new pace. Facts—not opinions—are guiding its methods and selection of machines.

And big business has adopted air power by Balanced Angle Compressors.

Builders of half the world's automobiles—

Makers of two-thirds of America's electrical equipment—

Refiners of eighty percent of industry's lubricants—

Great foundries, power plants, lumber mills, mines—

—now save money with Balanced Angle Air Compressors.

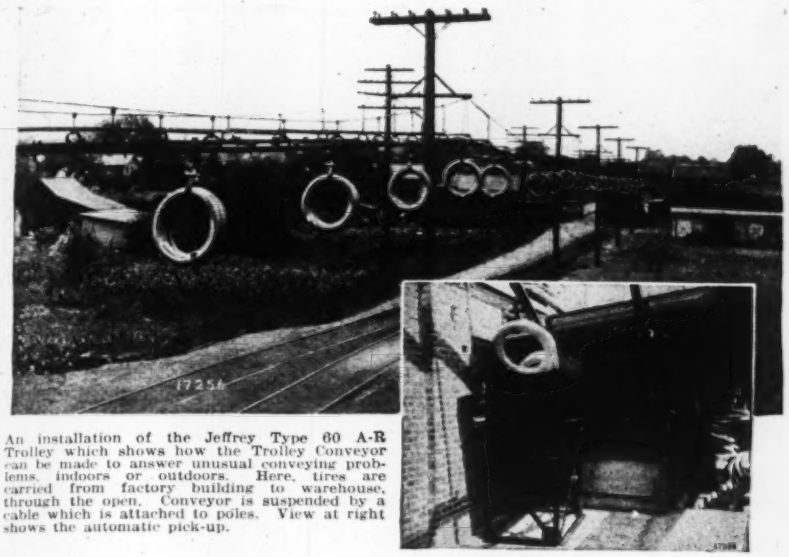
For these distinctive machines have proved their ability to supply air for less power, and lower maintenance.

The facts that persuaded big business to use Sullivan Compressors are available for you.

Send for Booklet 83-J.

SULLIVAN
MACHINERY COMPANY
404 N. Michigan Ave. Chicago, U. S. A.

Offices in all principal cities in the world



An installation of the Jeffrey Type 60 A-R Trolley which shows how the Trolley Conveyor can be made to answer unusual conveying problems, indoors or outdoors. Here, tires are carried from factory building to warehouse, through the open. Conveyor is suspended by a cable which is attached to poles. View at right shows the automatic pick-up.

Jeffrey Trolley Conveyors

Require No Radical Changes in Your Plant Layout

A Jeffrey Trolley Conveyor fits into an old building, or into plans for a new one with virtually no changes. Nor is it necessary to move any machinery. The Jeffrey Trolley will take work to and from any machine—through ovens, vats or other processes, wherever they are located—create a line production system anywhere.

By means of a toggle in the trolley unit, there are Jeffrey Trolley Conveyors to flex perfectly around vertical bends, the trolley maintaining a position radial to the bend.

Selective unloading devices permit selective routing of material to a number of points over the same conveyor. Each type of material will unload only at the proper group of stations.

Jeffrey is prepared to furnish any desired type of hook, pan or other container for use with these conveyors.

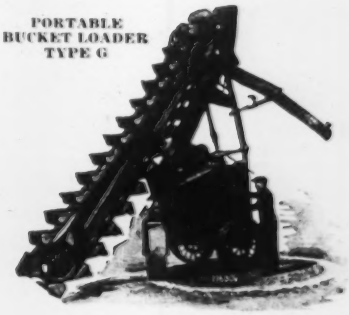
Send for Catalog No. 470-H which gives complete details of Jeffrey Trolley Conveyors.

The Jeffrey Manufacturing Company
923-99 North Fourth Street, Columbus, Ohio

New York	Pittsburgh	Detroit	Denver
Buffalo	Scranton, Pa.	Chicago	Salt Lake City
Utica	Boston	Charleston, W. Va.	Birmingham
Rochester, N. Y.	Cincinnati	Milwaukee	Houston
Philadelphia	Cleveland	St. Louis	

Jeffrey Manufacturing Company, Ltd. of Canada
Head Office, Montreal. Branch Office, Toronto

PORTABLE BUCKET LOADER TYPE G



Portables

Wherever shoveling is done, a Jeffrey Portable Conveyor or Loader will do the job faster and with great economy. One of these Portables will pay for itself in no time, and will return big dividends thereafter.

The Bucket Elevator type will do its own digging into a pile or bank. The belt type requires some means of placing material on the foot. These portables have all the merit of a permanent conveyor, with the portable feature in addition.

For stacking packaged materials, bags, boxes, crates, etc., Jeffrey Portable Stackers save floor space and labor. The boom is adjustable to height of stack.

The portable conveyor and loader shown above together with other Jeffrey portable units for handling bulk materials

24 IN. PORTABLE BELT CONVEYOR

are completely described in Bulletin No. 474-B. Jeffrey Portables for package materials are described in Bulletin No. 481-A.

Copies of these bulletins will be mailed on request.

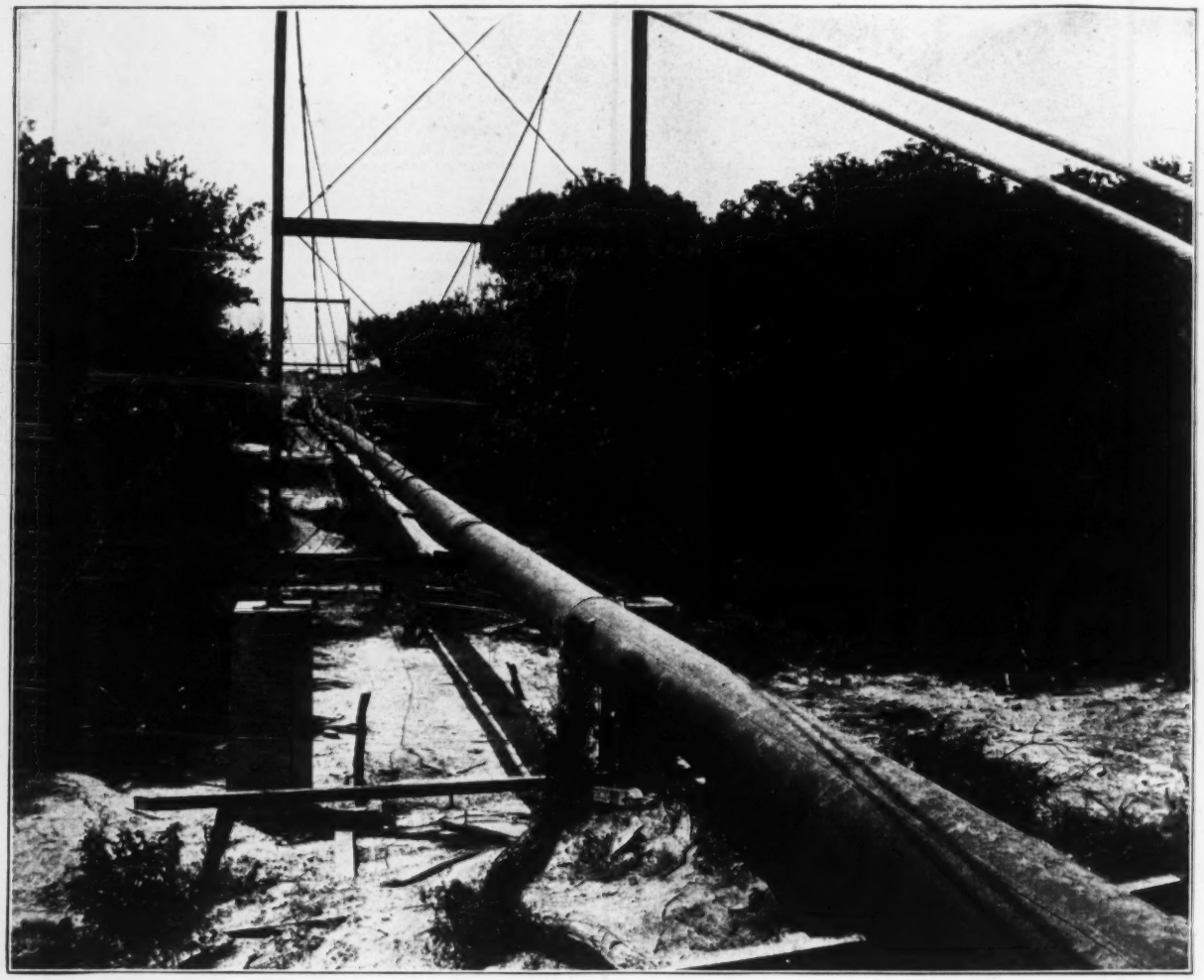
PORTABLE STACKER

JEFFREY
MATERIAL HANDLING EQUIPMENT

JEFFREY PRODUCTS

Elevators—Conveyors
Portable Loaders
Coal and Ashes Handling Equipment
Skip Hoists
Chains and Attachments
Sprocket Wheels—Gears
Crushers—Pulverizers
Sand and Gravel Handling, Washing and Screening Equipment
Locomotives
Mine Equipment
Ventilation Fans

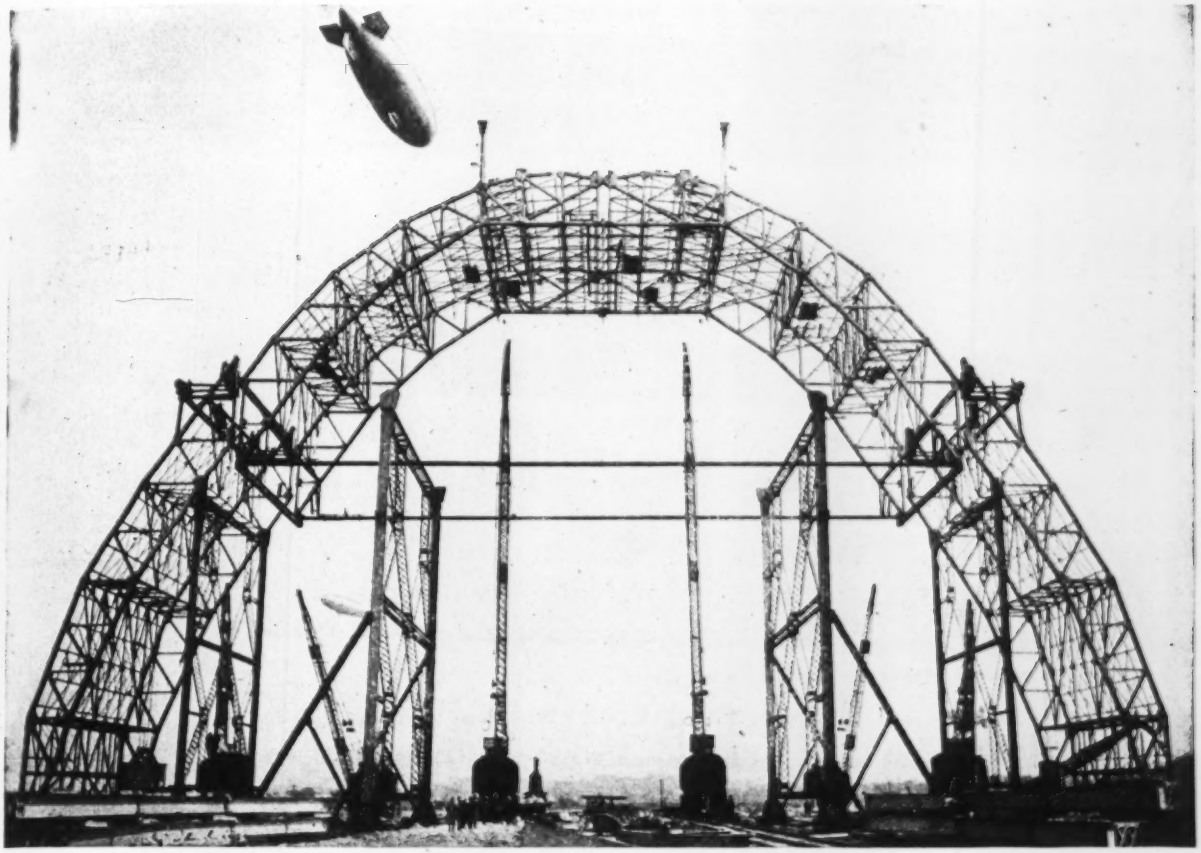
THE USUAL ~ THE UNUSUAL



and the extraordinary problems of pipe line construction have yielded more readily to the engineer who had SMITH-Welded Line Pipe and SMITHWeld Bell and Spigot and SMITHWeld Expansion Joints with which to work.

A. O. SMITH CORPORATION ~ *General Offices:* Milwaukee, Wis.
OIL AND GAS FIELD PRODUCTS DIVISION
District Offices: New York • Tulsa • Houston • Los Angeles

SMITH *WELDED* GAS LINE PIPE



Seven On Goodyear Hangar Erection

In constructing the giant airship factory and dock for the Goodyear Zeppelin Corporation at Akron, Ohio, the contractors have evolved unique erection methods which saved considerable time and money. Seven Industrial Brownhoist locomotive cranes, two having an overhead reach of 145 feet, were prime factors in this construction work.

The hangar, which will be 1184 feet long, is built around 13 arches having a center height of 198 feet and a clear span of 325 feet. The two haunch sections of these arches are erected to a height within reach of the long boom cranes. Then the center truss, after being completely assembled on the ground, is raised by cranes and counterweights and connected to the haunch sections.

Not only on spectacular jobs like the above, but also in the routine of your own shop and yard operations, an Industrial Brownhoist, equipped with bucket, hook, or magnet would effect a substantial saving. There is a size and type to meet your handling needs.

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.

Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division, Elyria, Ohio.

INDUSTRIAL BROWNHOIST

Ransome Announces A New Master Paver

Back in 1923, Ransome set the style in EXTRA HEAVY pavers with the "Forty-Forty" No. 21-E. This paver was simple, sturdy, powerful, fast.

Then in 1926, Ransome put on the market the 27-E Master Paver which at once met with widespread approval of contractors who wanted a paver capable of large output, long life and ease of operation.

Now for 1930, Ransome announces a new 27-E Master Paver which is still more powerful . . . sturdier . . . faster . . . simpler in design . . . with water control that is ACCURATE.

Inevitably, this means greater road mileage per year . . . an even lower upkeep cost . . . more dependable service than ever.

And backed by Ransome's seventy-nine years of service.

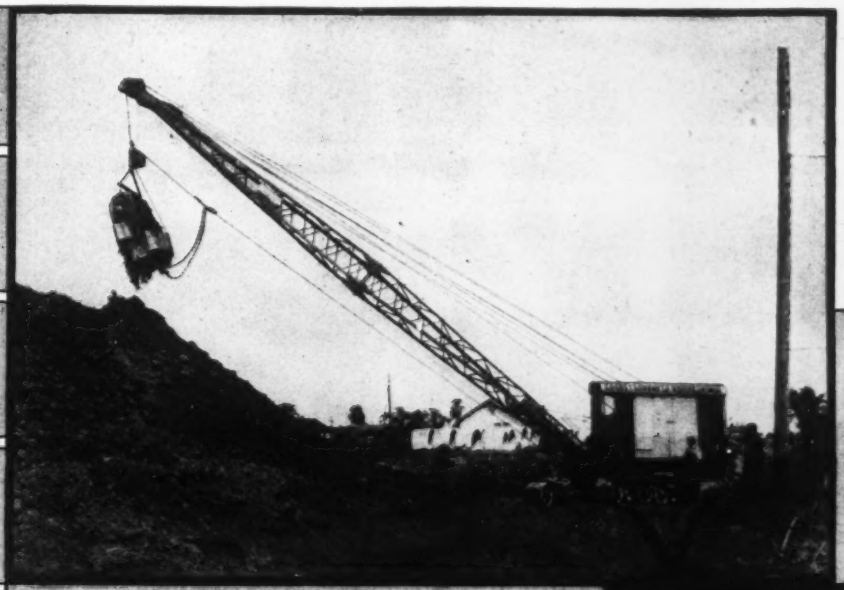
See it at Booth No. 218

1930 CONVENTION & ROAD SHOW
A. R. B. A.
ATLANTIC CITY N.J.
JAN. 13-18

PAVERS
10-E, 13-E, 27-E

Ransome Concrete Machinery Company
1850—Service for 79 Years—1929
Dunellen New Jersey

THEW



LORAIN 75B

THE BEST THAT THEW HAS BUILT

HERE is the improved heavy duty Lorain 75-B dragline, retaining all the features of the Center Drive and adding:

—a bigger Gasoline, Diesel or Electric motor with a powerful pull for the peak loads.

—the "64" and "68" tread Center Drive Crawler, longer—with greater support and traction for soft going. Self adjusting to the unevenness of the ground.

—an improved patented fairlead, self adjusting to the direction of pull of the cable lead.

—and improvements and refinements that make the machine the best that Thew has built.

THE THEW SHOVEL CO., Lorain, Ohio

METROPOLITAN
CANTON
BLOCK
METROPOLITAN
BESSEMER
AND OLEAN

BRICK

stands the "Gaff" of Industrial Service

Vitrified Paving Brick is ideal for the Industrial plant. It is designed and fired to stand the crash —jolt—and grind to which it is subjected in the shipping yard.

Nothing combines the long life qualities of brick for this kind of service. No rutting, no dusting, no crumbling, no action under acids, no absorption of oil, grease or water, lower maintenance and higher salvage value, are features common to vitrified brick not found in other materials.

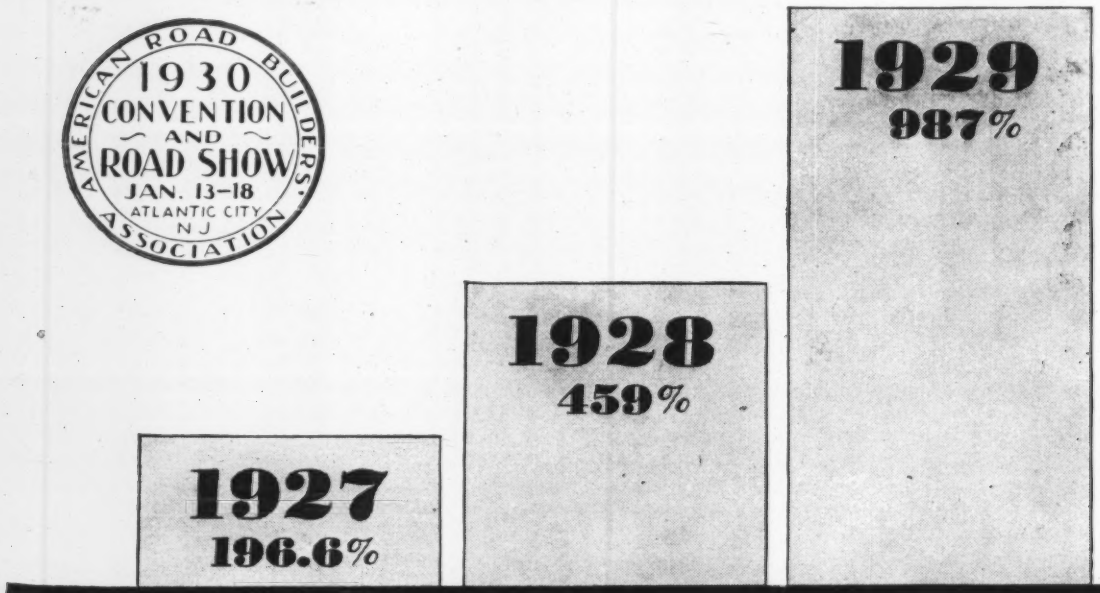
Metropolitan, Bessemer and Olean—three brands known to represent exceptionally high quality—are serving many industries faithfully as well as public officials in communities where brick pavements abound.

Specify any of the three brands named if you want the utmost in brick quality from America's largest producers of paving brick.

METROPOLITAN PAVING BRICK COMPANY
CANTON OHIO

M

AMERICAN ROAD BUILDERS' ASSOCIATION
1930 CONVENTION AND ROAD SHOW
JAN. 13–18
ATLANTIC CITY N.J.



Because Novo Rollr Engines Have What Other Engines Do Not

YEAR after year Novo Rollr Engine sales have mounted higher and higher until in 1929 they were 987% greater than in 1926—just three years ago.

No other engine can match this popularity—for Novo Rollr Engines have what other engines do not.

Timken Roller Bearings on the crank shaft and drive shaft—the key to Novo's anti-friction power, lower gas consumption, overpower, compactness, and freedom from repairs and lubrication troubles.

How good an engine really is—is best indicated by sales made to the men in the field.

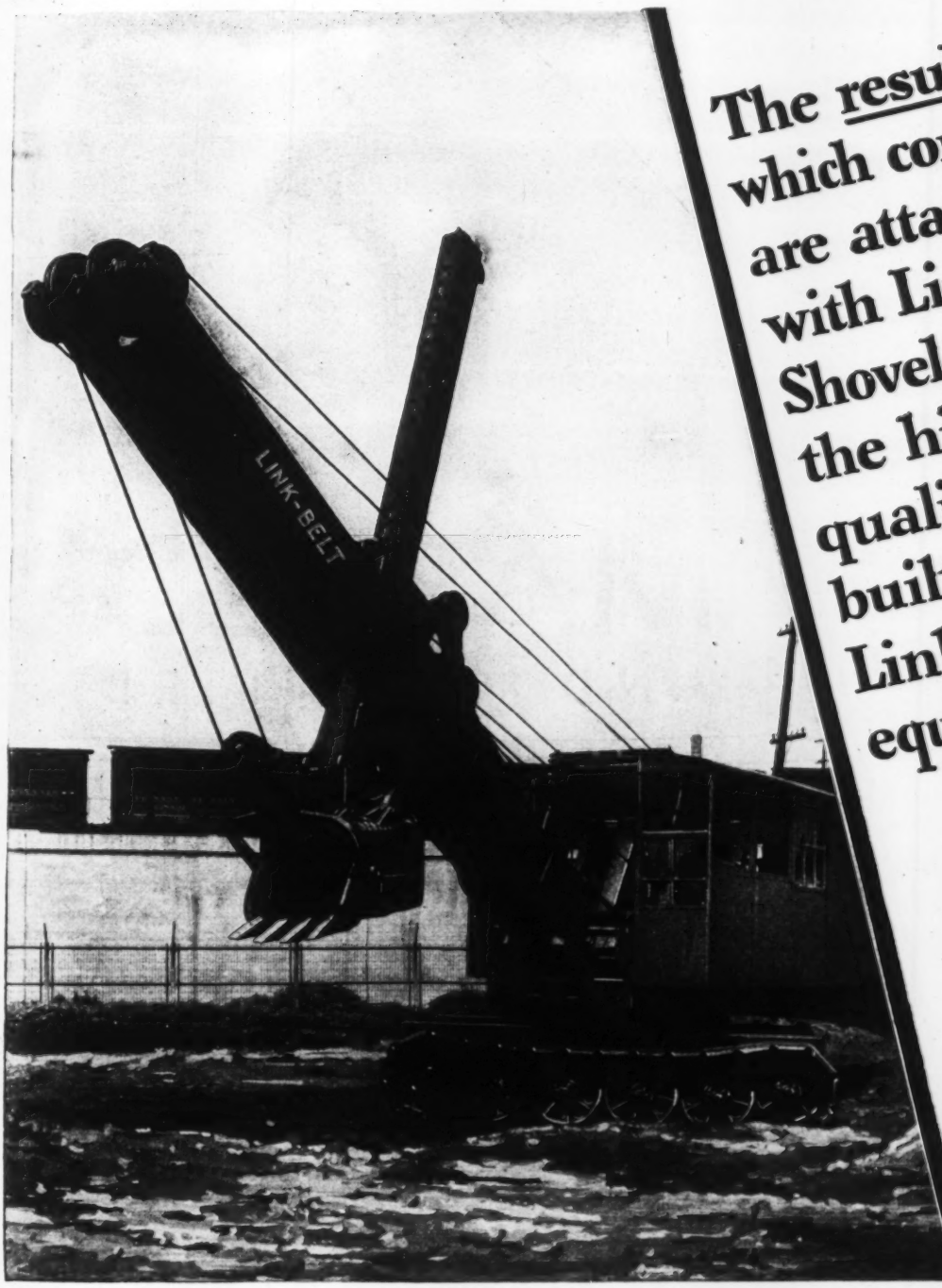
They are interested only in what an engine can do for *them*.

And their rapidly increasing preference for Novo Rollr Engines proves, as nothing else can, that Novo's anti-friction power is unmatched by any other engine in Novo's power range.

NOVO ENGINE COMPANY
200 Porter Street, Lansing, Mich.
CLARENCE E. BEMENT,
Vice President and General Manager

NOVO
ANTI-FRICTION ENGINES

Sales Have Increased Ten Times Over



The results which contractors are attaining with Link-Belt Shovels justify the high quality built into Link-Belt equipment

3540

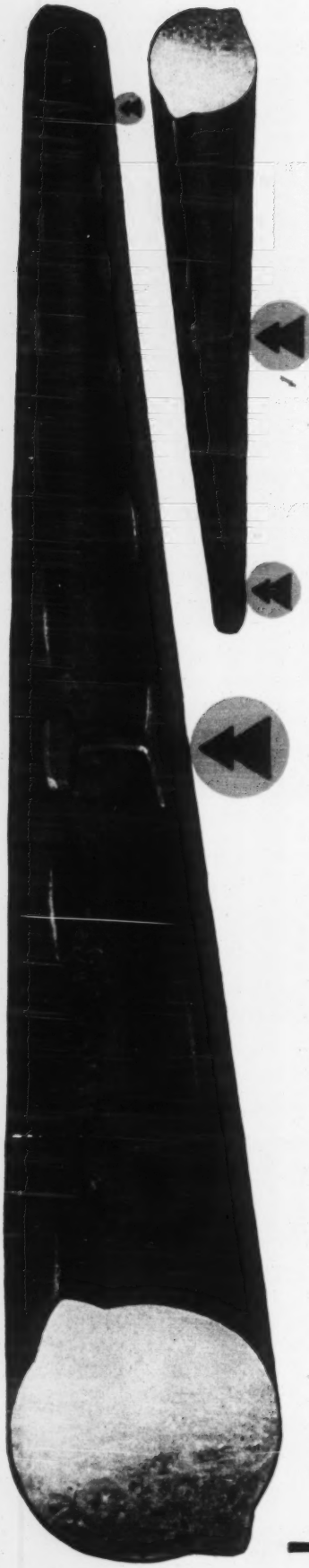
LINK-BELT COMPANY

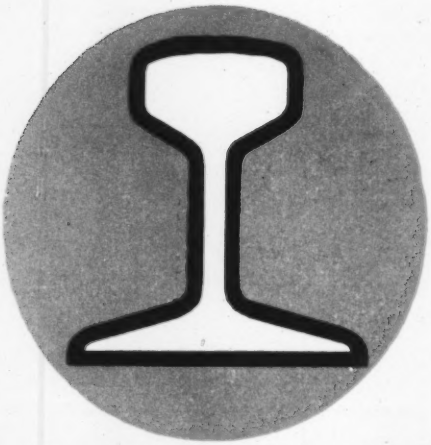
Builders of Locomotive Cranes for 30 years. Portable Loaders—Crawler Cranes—Shovels—Draglines

CHICAGO, 300 W. Pershing Road *Offices in Principal Cities*

LINK-BELT

SHOVELS + CRANES + DRAGLINES



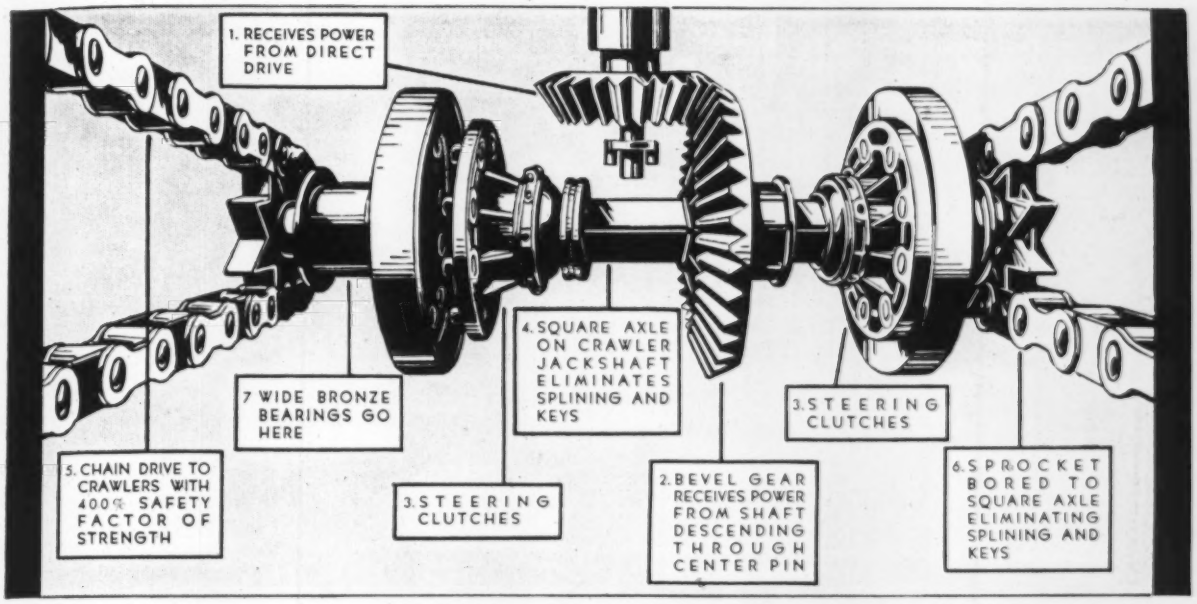


MARKED
AND CERTIFIED

To guarantee high standard quality this association symbol is rolled on all deformed rail steel reinforcing bars produced by these member mills: Buffalo Steel Company, Tonawanda, N. Y.; Burlington Steel Company, Hamilton, Canada; Calumet Steel Company, Chicago, Ill.; Canadian Tube and Steel Products Limited, Montreal, Canada; Connors Steel Company, Birmingham, Ala.; Danville Structural Steel Company, Danville, Pa.; Franklin Steel Works, Franklin, Pa.; Laclede Steel Company, St. Louis, Mo.; Missouri Rolling Mill Corporation, St. Louis, Mo.; Pollak Steel Company, Cincinnati, Ohio and West Virginia Rail Company, Huntington, W. Va.

Rail Steel Bar Association, Builders Building, Chicago

RAIL STEEL
for concrete reinforcing


1. RECEIVES POWER FROM DIRECT DRIVE
4. SQUARE AXLE ON CRAWLER JACKSHAFT ELIMINATES SPLINING AND KEYS
7 WIDE BRONZE BEARINGS GO HERE
3. STEERING CLUTCHES
5. CHAIN DRIVE TO CRAWLERS WITH 400% SAFETY FACTOR OF STRENGTH
3. STEERING CLUTCHES
2. BEVEL GEAR RECEIVES POWER FROM SHAFT DESCENDING THROUGH CENTER PIN
6. SPROCKET BORED TO SQUARE AXLE ELIMINATING SPLINING AND KEYS

HERE IS IDEAL SHOVEL . . .
. . . TRAVEL AND STEER

(PATENTS PENDING)

A Great Line of Shovels at a Great Road Show
Atlantic City
January 13-18
Byers Booth No. 223

Byers Complete Line

Byers 1¼ yd. Master
Shovel, Crane, Dragline
Byers 1 yd.
Shovel, Crane, Dragline, Trencher
Byers ¾ yd.
Shovel, Crane, Dragline, Trencher, Skimmer
Byers ½ yd. Bulldog
Shovel, Crane, Dragline, Trencher, Skimmer
Byers ½ yd. Half Circle Bear Cat
Shovel, Crane, Trencher, Skimmer

NO old fashioned gear boxes in Byers Shovel and Crane travel and steer mechanism. Extra shafts, bearings and other power wasting devices are eliminated in this two-speed independently operated crawler.

Simplified design has been achieved by rigid engineering applied to Byers crawlers. But each of the essential parts is ruggedly built to outlive ordinary crawler life—and with a minimum of maintenance required to keep the parts oiled and greased.

Travel and steer mechanism is entirely independent of superstructure operations such as swinging and hoisting.

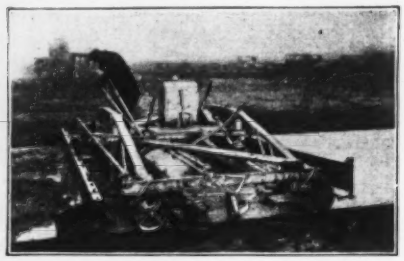
When you have an extra steep grade, an extra rough, rocky path to travel or very soft material to plough through, you may depend on Byers Crawler to make it without stalling or sputtering.

This fine design is typical of the fine engineering throughout the entire machine. Superstructure, too, is simplified, rugged, dependable.

A great design, this new Byers, and it's applied to all four models—1¼ yd., 1 yd., ¾ yd. and ½ yd. It's worth while for you to write today for catalogs!

THE BYERS MACHINE COMPANY, *Ravenna, Ohio*
Sales and Service Throughout the Country

BYERS
SHOVELS AND CRANES



LAKEWOOD TYPE C FINISHER
WITH TANDEM SCREED ATTACHMENT

THE LAKEWOOD ENGINEERING CO.

CLEVELAND, OHIO

FOR

1930

THE LAKEWOOD TANDEM SCREED ATTACHMENT

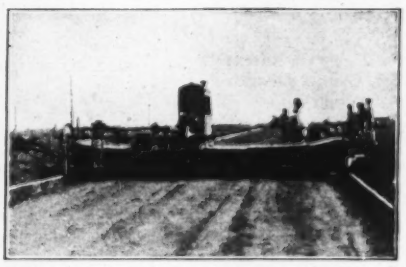
Adaptable to All Lakewood Type C Screeds, and adding still more to the flexibility of this machine by making available to present as well as future owners, their choice of Single Screed, Tandem Screed, or Combined Screed and Tamper operation.

THE LAKEWOOD POWER SUBGRADER

Applies power in a simple, practical way to fine grading. Insures correct thickness and cross section of slab at all points. Insures against over-run of material. Mills the grade to depth and crown, and deposits excess material outside the forms.

To be Exhibited with other Lakewood Paving Equipment Space 229, Atlantic City Auditorium, January 11-18, 1930

Literature available on request



THE LAKEWOOD POWER SUBGRADER
CUTTING 3 INCHES OF TEXAS 'DOBE

The STARTING POINT

WHERE your standard of value originates—where you return to compare whatever else you have seen—that's "the starting point." . . . . . The Half-Yard Insley is "the starting point" in the half-yard shovel field. Because of its operating speed, its ball and roller bearing construction, its operating ease and flexibility—because of its universal adaptability and its startling and consistent performance the half-yard Insley gives you a set of values by which you can judge half-yard shovels.

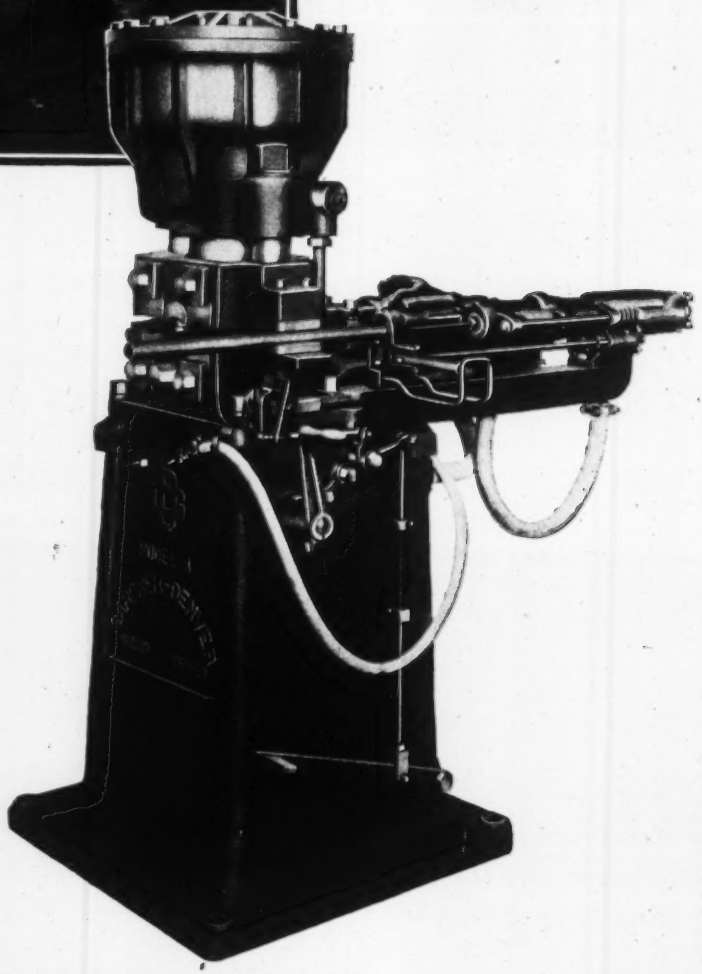
If you don't know the Insley you don't know half-yard shovels.

INSLEY

INSLEY MANUFACTURING COMPANY, Engineers and Manufacturers INDIANAPOLIS, INDIANA Division of National Equipment Corporation 731

For Sharp Drill Steel

Model DS-8 Sharpener



FOR many years the Model DS-8 has met all requirements of discriminating users of Drill Steel Sharpeners the world over. Although continually improved as time has gone by, no major or radical change has been necessary to keep this machine abreast of the times. The purchase of a Model DS-8 is equivalent to the purchase of perfect drill bits and shanks in large daily quantities at very low cost for operation and maintenance.

Combined with a Model HP-20 Bit and Shank Punch and supplemented by a Model DF-1 Oil Forge, the Model DS-8 makes an ideal installation where a large quantity of drill steel is required.

Write for Bulletin

GARDNER-DENVER COMPANY
ROCK DRILL DIVISION
DENVER, COLORADO
Sales Offices Throughout the World

GARDNER-DENVER

HOW LONG « « «

PAGE 10

will it take you to save the extra cost of a DIESEL MOTOR?

NORTHWEST ENGINEERING CO.

The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines

1727 Steger Building

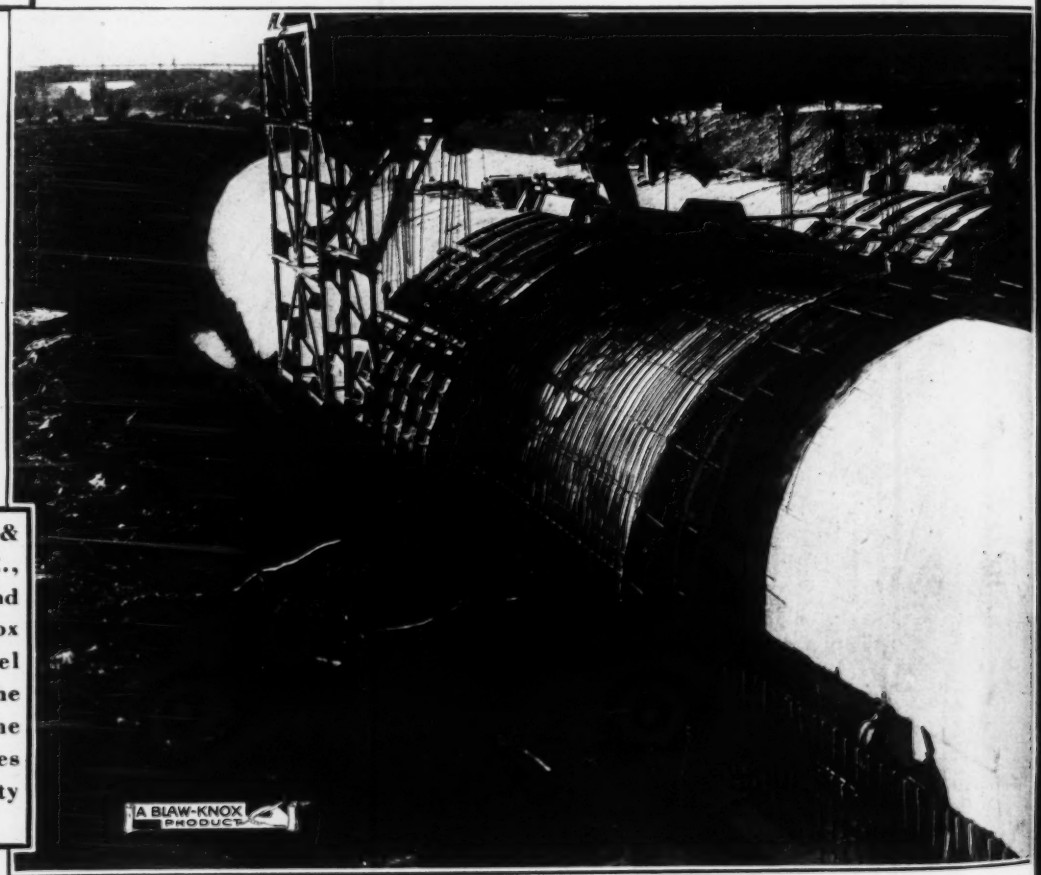
28 E. Jackson Boulevard, Chicago, Ill., U.S.A.

CUT FUEL COSTS with a NORTHWEST OIL ENGINE. It brings gasoline motor dependability at less initial cost

NORTHWEST

W. E. CALLAHAN CONSTRUCTION CO., are using Blaw-Knox Telescopic Steel Sewer Forms on the 32 ft. section of the River des Peres Drain for the City of St. Louis.

Ready Mixed Concrete, produced at a Blaw-Knox Central Mixing Plant, is hauled to the job and dumped from the trucks directly into the forms.



A. GUTHRIE & COMPANY, INC., are using inside and outside Blaw-Knox Telescopic Steel Sewer Forms on the 29 ft. section of the River des Peres Drain for the City of St. Louis, Mo.

Steel Forms *by* BLAW-KNOX

insure that St. Louis Sewers will be built economically and that the schedule of construction will run like a clock.

Where Blaw-Knox enters—*form grief* stays away from the job.

Blaw-Knox points with pride to twenty-three years of experience and engineering accomplishment in making thousands of concrete jobs economically possible.

Your work, large or small, can probably benefit by Blaw-Knox STEEL FORM engineering advice—*free for the asking.*

BLAW-KNOX COMPANY

2001 Farmers Bank Bldg., Pittsburgh, Pa.

New York	Detroit	Chicago
Buffalo	Cleveland	Baltimore
Birmingham	Boston	Philadelphia

Export Division:
Milliken Bros.—Blaw Knox Corp.,
Canadian Pacific Building
New York, N. Y.

TRADE MARK REG. U.S. PAT. OFFICE
BLAW-KNOX

The Gas-Electric is Gaining in Popularity

On the Gas-Electric you get independent drives on the hoist, swing and crowd

THE flexible operation of the steam shovel is obtained in the Gas-Electric by the use of separate and independent drives for the hoist, swing and crowd. The motors are direct geared to these motions and deliver their power in the same manner as the engines of the steam shovel—giving high speed under light load, low speed under heavy load and stall with maximum pull under extreme load.

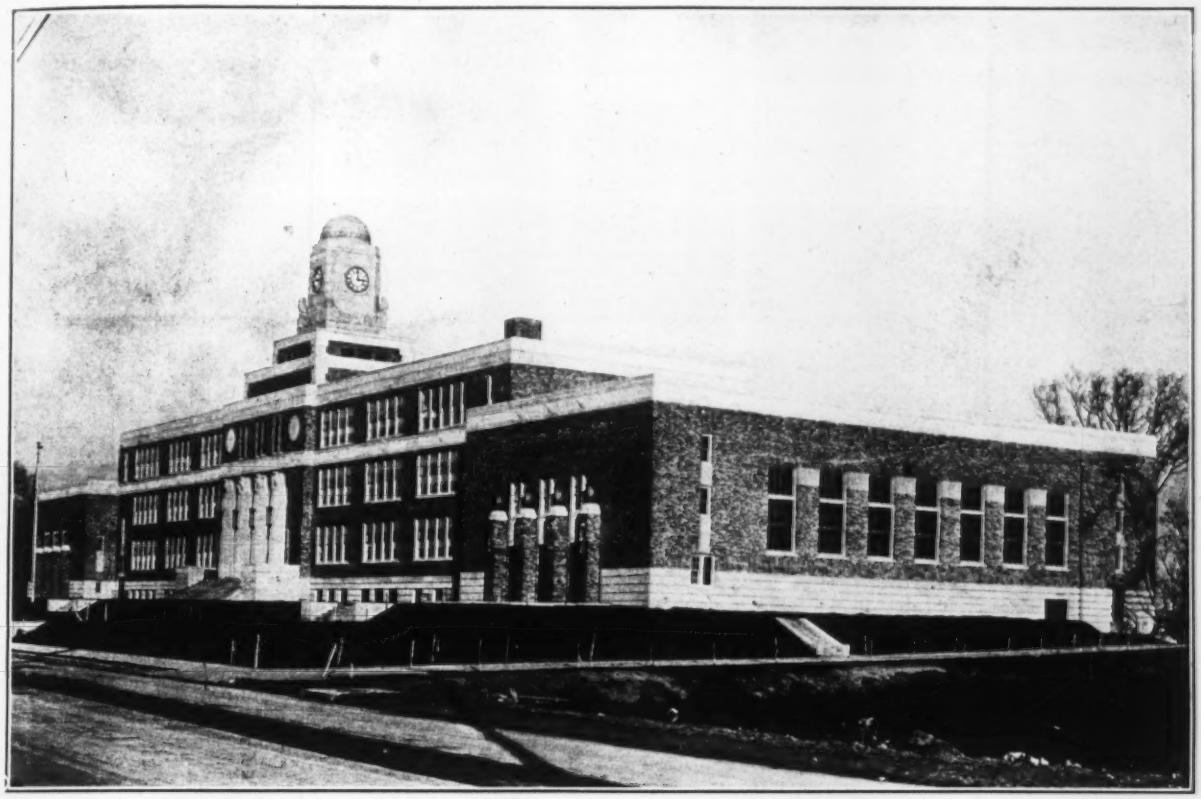
THE MARION STEAM SHOVEL COMPANY
MARION, OHIO, U. S. A.

Gasoline for Power
Electricity for Flexibility

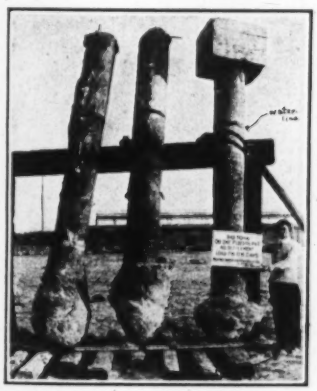
MARION

29005

This Building Stands on MacARTHUR Compressed Concrete Piles *"Pedestal Type"*



HIGH SCHOOL, VALLEY STREAM, N. Y.• H. Wiedersum, *Architect*• A. Brociner, *Engineer* • Zerbe Construction Co., *Contractor* • 543 *Pedestal Type* Piles



MacARTHUR Pedestal Type Piles after one of them had supported 50 tons for 10 days without settlement. Note how compressing of concrete has enlarged shaft, in pile at left, to fill soft spot in soil.

Sandy Soil with a High Head of Water

Pedestal Type Pile, Practical and Economical

The vacant plot (right foreground of illustration) shows the *water level* to be about *two feet* below the roadway. The *Pedestal Type* Pile is best suited for such a soil condition. Because of the large bulb or *pedestal* formed at the bottom of each pile it was only necessary to drive these piles to an average depth of 28 feet. It would have been necessary to drive any other type of pile much deeper with a consequent cost increase.

For the right kind of job at the right price,
"Put it up to MacARTHUR."

Check your requirements against MacArthur qualifications:

PRODUCT	*proven*
EXPERIENCE . . .	*20 years*
EQUIPMENT . . .	*latest*
RESOURCES . . .	*unlimited*
PERSONNEL	*capable*
CLIENTELE . . .	*illustrious*
RESPONSIBILITY	*demonstrated*
ENGINEERING . . .	*sound*
PERFORMANCE . .	*100%*
SPEED	*record-breaking*

MacARTHUR

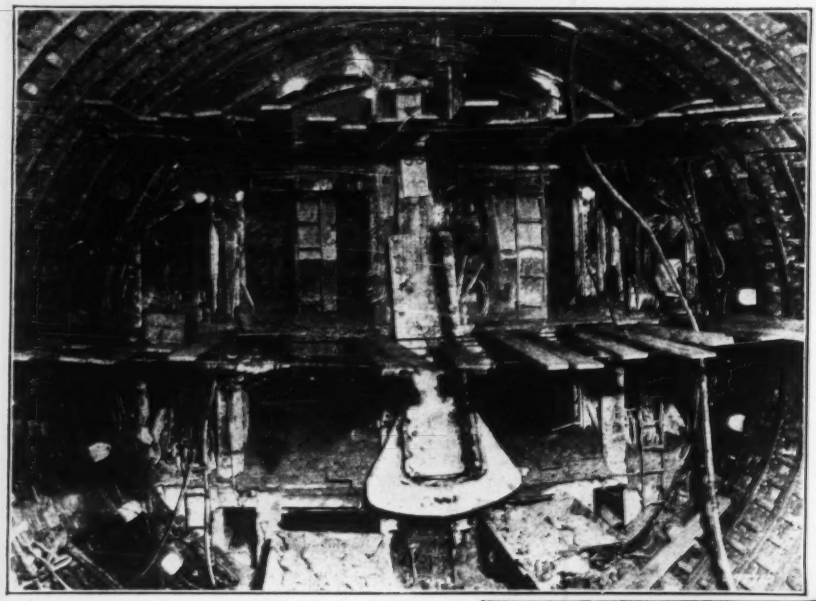
COMPRESSED CONCRETE PILES

19 WEST 44th STREET, NEW YORK

Chicago Cleveland Pittsburgh New Orleans San Francisco Detroit

Canadian MacArthur Concrete Pile Co., Ltd., Montreal

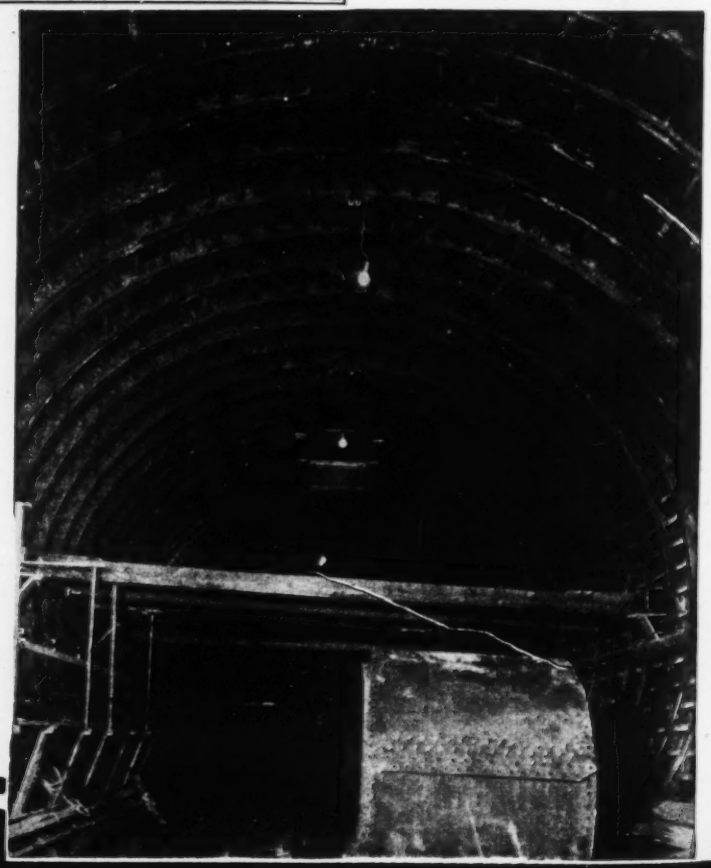
LINKING THE LIFE



View of Detroit-Canada Tunnel showing application of specially designed, pressed and welded Commercial Steel Liner Plates.

Engineers: Parson, Klapp, Brinkerhoff and Douglas.

Construction view of Detroit-Canada Tunnel: Shield driven, the shield is 32′ 3⅜″ in diameter and 15′ 3½″ overall length. The skin plate is forced forward by 30 hydraulic jacks—numbered in the photograph—of 250 tons capacity. The heavy erector arm places segments in each ring of steel liners. Small electric hoists on platforms of shield operate clay knives used in excavating stiff material. Conveyors are not shown here.



LIFE OF TWO COUNTRIES

ONE of the great engineering achievements, attracting nation wide attention, is the Detroit-Canada Tunnel that will link the life of two countries.

This huge project—a tunnel 31 feet 8 inches outside diameter and 5,845 feet long—from street level to street level—crosses the Detroit River and extends into the business sections of Detroit and Windsor.

In constructing the land sections—for the first time in a tunnel of these proportions—steel lining is used in shield driven tunnel work.

Commercial Steel Liner plates—pressed, welded and especially designed for this job are employed. According to the engineer—

"This type of lining was adopted over cast-iron segments on the basis both of economy and strength. The weight of the steel lining is about 2.3 tons per linear foot of tunnel, whereas a comparable cast iron lining would weigh about 8 tons."

Not only is the weight of the lining reduced, but the *cost is reduced to about 40% of the heavier types.*

We specialize on difficult jobs. Let our engineers demonstrate the efficiency and economy of Commercial Steel Liner Plates.

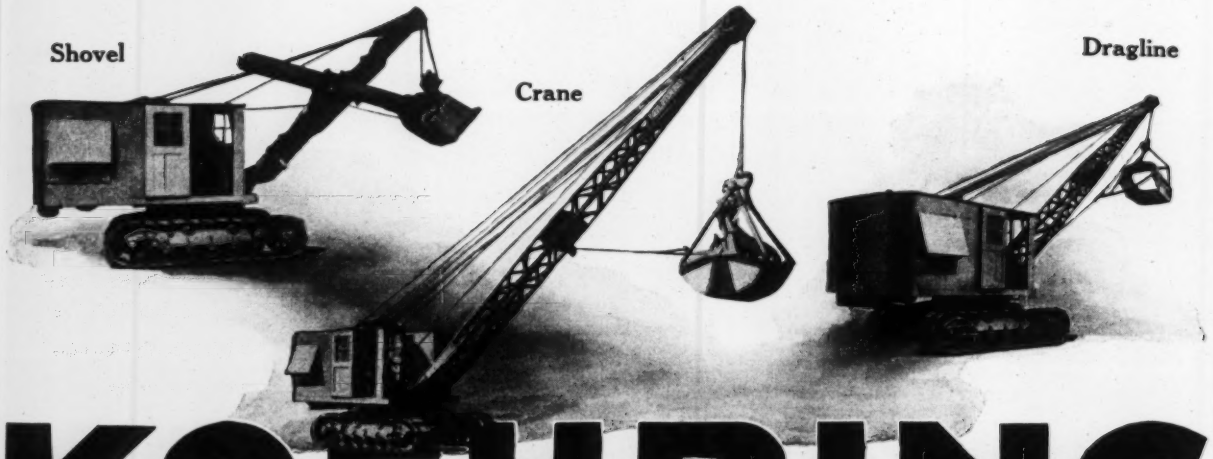
ADVANTAGES

Timbering is eliminated—less concrete is needed—size of tunnel bores may be increased with less excavation—tunnel walls have tremendous strength—plates are easily installed and are adaptable to Round, Bee Hive or Egg Shaped tunnels—safety is enhanced—no skilled labor is required—costs are materially reduced.

The Commercial Shearing & Stamping Company

General Stampings, Liner Plates, Tank Heads, Pallets and Racks

YOUNGSTOWN, OHIO



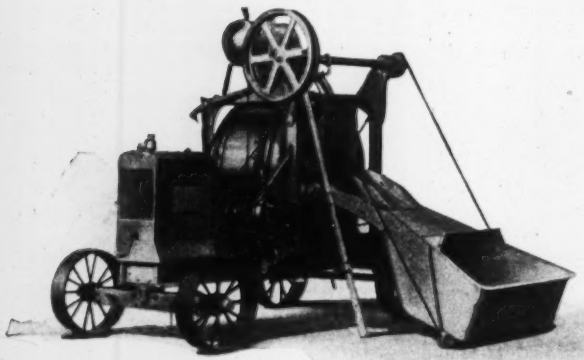
KOEHRING

KOEHRING experience, Koehring Heavy Duty construction, are two of the greatest profit factors you can put on the job!

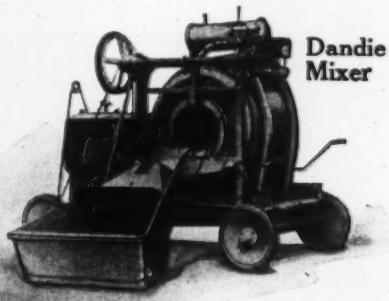
Koehring equipment is sold through organizations that are *service* as well as sales organizations!

Again we say *"Know the Koehring!"*

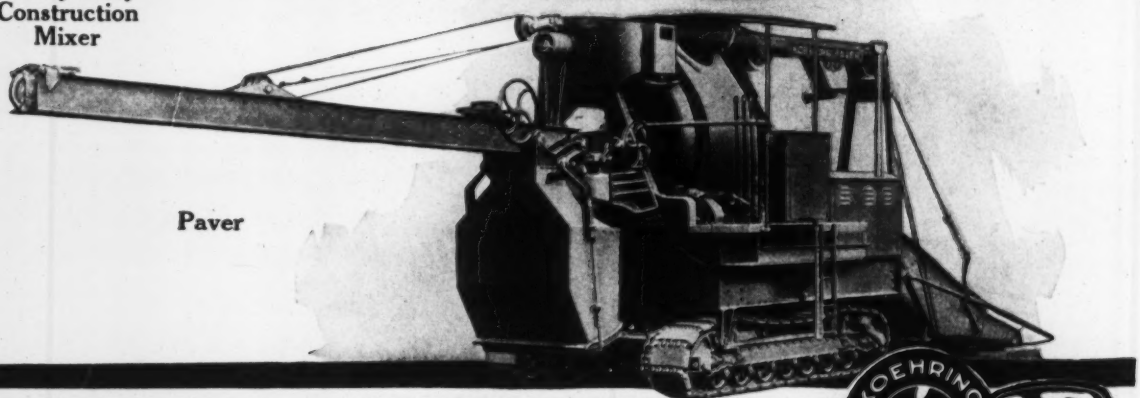
Write for Bulletin No. 8 on any of the machines interested in.



Heavy Duty Construction Mixer



Dandie Mixer



Paver

A4710-I

KOEHRING COMPANY MILWAUKEE, WISCONSIN

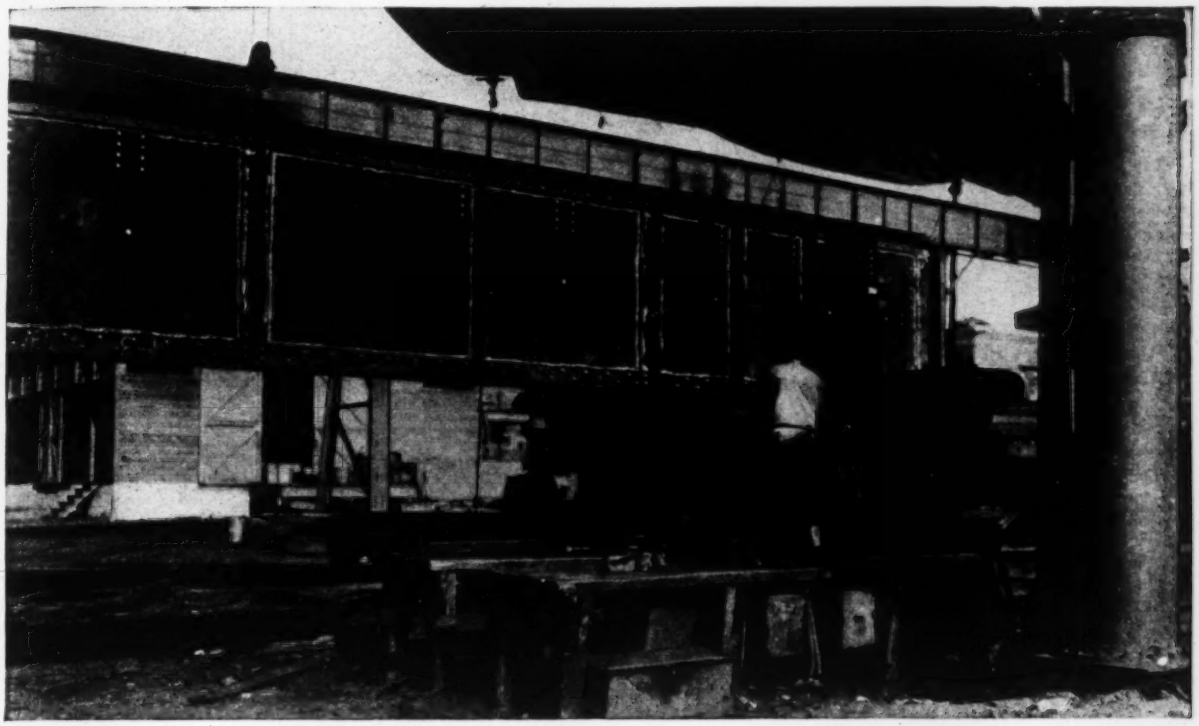
PAVERS, MIXERS—GASOLINE SHOVELS, PULL SHOVELS, CRANES AND DRAGLINES

Sales Offices and Service Warehouses in all principal cities

Foreign Department, Room 579, 50 Church Street, New York City

Division of National Equipment Corporation

KOEHRING HEAVY DUTY NEC



Proved PROTECTION *for* Iron *and* Steel

DUTCH BOY SOLDER

Another Dutch Boy product is solder. There is a Dutch Boy solder for every purpose, each bar or ingot carrying a number to indicate its exact composition. Dutch Boy 111, for example, contains 50% tin and 50% lead.

Proved by the rigid tests of experts . . . *proved* by its continued use for more than 100 years—pure red-lead is recognized as the standard protective paint for metal.

On railroads, in the shipyards . . . and on bridges, tanks and steel structures of every type . . . you'll find red-lead paint in excellent condition after exceptionally long periods of service.

That is why paint authorities say: "Three coats of pure red-lead give protection for metal that is unexcelled in length of life."

Fine, uniform, highly oxidized . . . there is no better red-lead obtainable than Dutch Boy red-lead. It comes in two forms . . . paste and liquid. The liquid (ready for the brush) is supplied in six colors — natural orange-red, light and dark brown, light and dark green, and black. The paste comes in natural orange-red and can be shaded to dark colors.

NATIONAL LEAD COMPANY

New York, 111 Broadway • Buffalo, 116 Oak Street Chicago, 900 West 18th Street • Cincinnati, 659 Freeman Ave. • Cleveland, 820 West Superior Ave. • St. Louis, 722 Chestnut St. • San Francisco, 235 Montgomery St. • Boston, National-Boston Lead Co., 800 Albany St. • Pittsburgh, National Lead & Oil Co. of Pa., 316 Fourth Ave. • Philadelphia, John T. Lewis & Bros. Co., Widener Bldg.

DUTCH BOY RED-LEAD

275 Ton Monighan Walks 7 Miles in Two Days and a Night Through Wooded, Rain-Drenched Country

The above illustration shows a Monighan Dragline as it was making a seven mile cross-country trip from where it was erected to where it would go to work on a 2,130,000 cu.yd. levee construction job, near Baton Rouge, La.

The country through which it went was well wooded and the Monighan had to pick its way between trees and stumps. But they were only a small part of the difficulties encountered, because heavy rainfall for over a week had reduced the ground to almost a marsh, leaving deep mud holes to be avoided.

It was a sight worth seeing to watch this huge Monighan literally "side-stepping" trouble, veering off sharply at an angle when especially soft spots were met with, or when trees and stumps obstructed its path.

The Monighan's mobility on soft, rough or hilly ground, its adaptability and its economical handling of large yardages warrant your investigation.

MONIGHAN MANUFACTURING CORPORATION
945 Kilpatrick Ave., Chicago, Ill.

MONIGHAN

McKiernan-Terry No. 0 and No. 1 fast work driving timber sheeting!

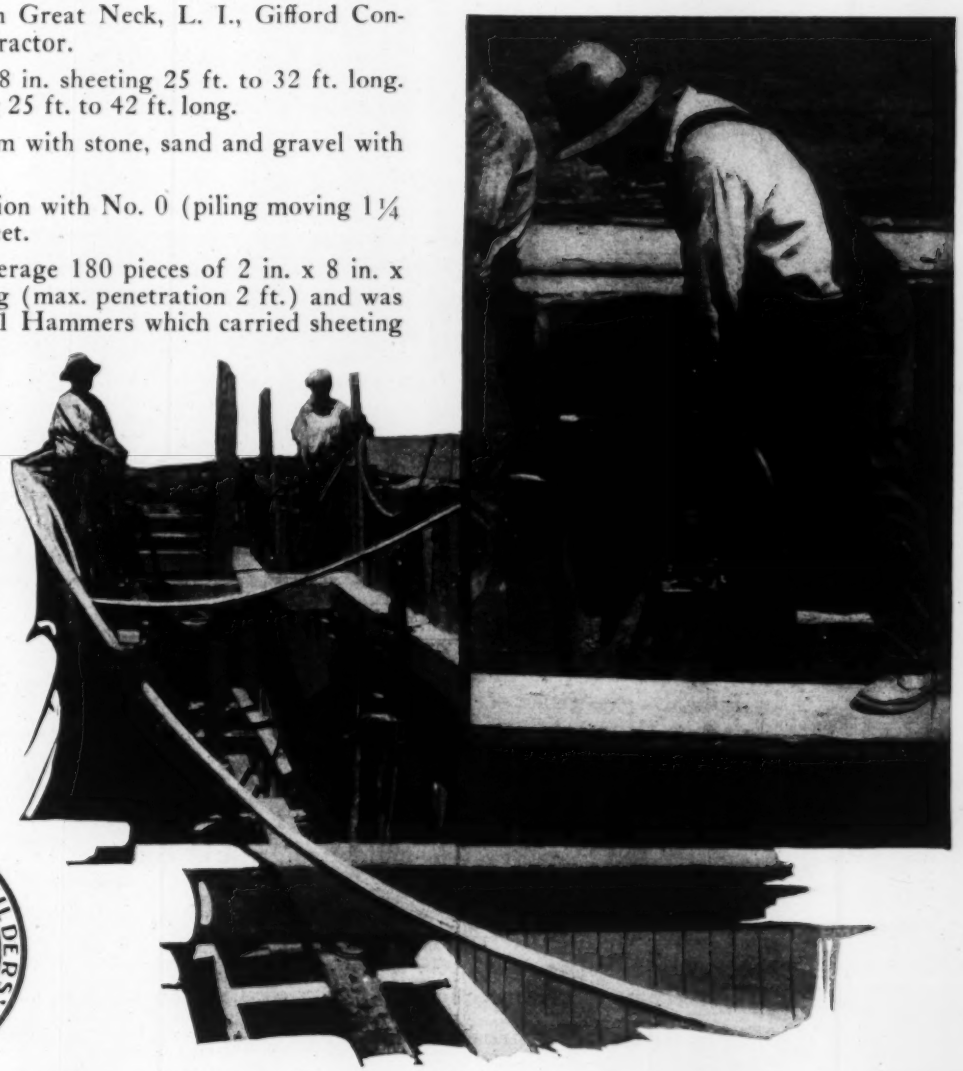
Location—Sewer in Great Neck, L. I., Gifford Construction Co., Contractor.

7000 ft. of 2 in. x 8 in. sheeting 25 ft. to 32 ft. long. 5000 ft. of sheeting 25 ft. to 42 ft. long.

Through sandy loam with stone, sand and gravel with clay mixture.

Maximum penetration with No. 0 (piling moving 1¼ in. per minute) 2 feet.

No. 0 drove an average 180 pieces of 2 in. x 8 in. x 20 ft. wood sheeting (max. penetration 2 ft.) and was followed by 2 No. 1 Hammers which carried sheeting to final penetration.



AMERICAN ROAD BUILDERS' ASSOCIATION 1930 CONVENTION AND ROAD SHOW JAN. 13–18 ATLANTIC CITY, N.J.

Yes—we make these "little fellers" to replace hand labor—and we also make all sizes of pile hammers up to the giant 11-B2 to drive precast piles weighing TONS. The most complete line of double-acting hammers in the world. *Send for Catalog.*

McKIERNAN-TERRY CORPORATION

13 Park Row, New York City
MANUFACTURING ENGINEERS
WORKS: DOVER, NEW JERSEY

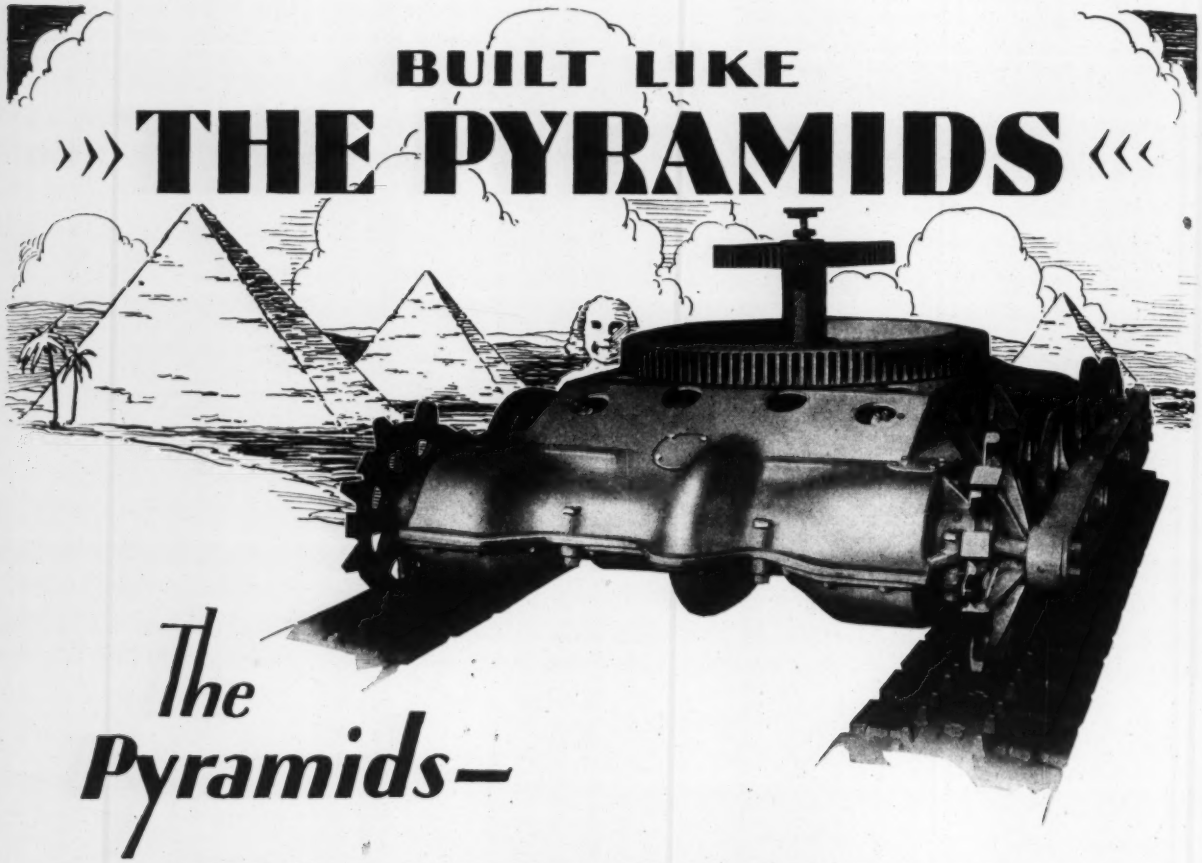
Pile Hammers, Drilling Machinery, General Construction Machinery and Accessories

NATIONAL HOISTING ENGINE DIVISION
WORKS: HARRISON, NEW JERSEY
Steam, Gasoline and Electric Hoists, all types and sizes

STEELE & CONDICT DIVISION
WORKS: JERSEY CITY, NEW JERSEY
Machinery and Equipment for all types of movable bridges

On November First, the McKiernan-Terry Drill Company changed its corporate name to McKiernan-Terry Corporation and acquired ownership of and became the successor to the National Hoisting Engine Company of Harrison, N. J., and Steele & Condict, Inc., of Jersey City, N. J. The consolidation of three firms with products going into the same fields has been effected to provide adequately for greater business expansion.

BUILT LIKE »» THE PYRAMIDS ««



The Pyramids—

THOSE gigantic structures that have been in existence since the early period of human history — speak of ages of growth and experience. That same rock-like stability found in the pyramids of Egypt must be "built-in" material handling equipment today.

Consider for instance the rigid design and construction of the Moore Speedcrane "Made in Manitowoc". Consider its single unit crawler base casting of high manganese steel, its automotive type full floating rear axle of chrome nickle steel, its simple yet sturdy gear shift arrangement, its substantially built main drive shaft, its drums, etc.

Surely these features of substantial construction invite your attention.

You will find our catalog interesting — it tells all about this tireless and speedy crane (convertable into shovel, trenchoe and dragline). Write today.

MANITOWOC ENGINEERING WORKS, *Manitowoc, Wis.*

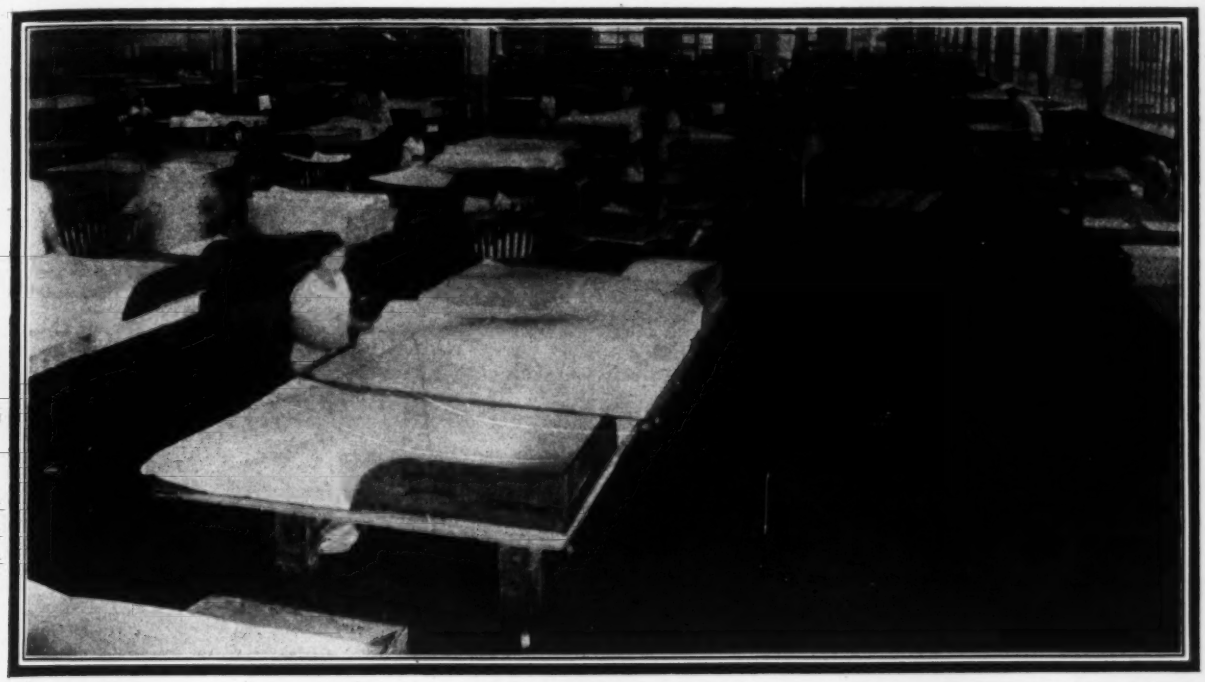
(Sole Licensee to manufacture and sell Moore Speedcranes, Shovels, Draglines and Trenchoes)

SPEEDCRANE

MOORE ◆ MANITOWOC

SPEEDCRANE

SHOVEL ~ CRANE ~ TRENCHOE ~ DRAGLINE



Appleton Coated Paper Co.
INSTALLS BLOX-ON-END

Other paper manufacturers using BLOX-ON-END include:

Kimberly-Clark
Neenah Paper Co.
National Paper Products Co.
West Virginia Paper & Pulp Company
Consolidated Water Power & Paper Co.
Great Northern Paper Company

A few months ago this nationally known paper manufacturer occupied the new Finishing Room addition to its Appleton, Wis., mill. It was floored throughout with 25,000 sq. ft. of BLOX-ON-END. Lockwood Greene & Company, Architects; C. R. Meyer & Sons Company, Contractors.

In competition with less expensive floors, BLOX-ON-END was the choice of architect, owner and contractor because—

A record of past performance was convincing proof that BLOX-ON-END was long-lived—that it remained smooth—that heavier loads were moved over it with less effort—that vibration was eliminated enabling capacity loading of trucks without danger of damaged paper stock due to "jogging"—that the floor's cleanliness and resiliency were appreciated by employees.

BLOX-ON-END Flooring is widely used in all industries. Let us send you Descriptive Booklet and a free sample.

BLOX - ON - END comes to the job in 8 ft. lengths with small tough blocks dovetailed endwise onto base-boards. The end-grain fibres form the wearing surface. Easily laid in old or new plants.

CARTER BLOXONEND FLOORING COMPANY
Kansas City, Missouri
Branch Offices in Principal Cities—See Sweet's

BLOXONEND FLOORING
Lays Smooth *Stays Smooth*

You can broom—clean snow in Baltimore but in 6-foot drifts you need a he-machine

The HAISS Snow Loader

Trying to use anything less than a heavy caterpillar-mounted DIGGING MACHINE in deep, wet snow, is just about like sending out a gang of men with toy shovels. They could go through the motions but wouldn't move much snow. The Haiss Model 27 Snow Loader is a heavy-duty machine—especially designed and built for heavy work in the heavy snow belt. It has the weight and tractive power to cut its way right through a high pile of soggy crusted snow. It has the digging force to break up frozen masses. It has the balance and design-excellence to do its work without destructive vibration. IT IS A BIG MACHINE FOR THE BIG WORK.

Write for Catalog 1027 to-day!

Geo. Haiss Mfg. Co., Inc.
140th Street and Rider Avenue
New York, N. Y.

HAISS Snow Loaders

Haiss Snow Loaders are built by the makers of the well known successful Haiss Creeper loaders for digging stone, coke, sand, gravel, coal and kindred difficultly handled materials. The world knows Haiss Equipment by its accomplishments

The DIESEL GIANT
pulls through
P&H Diesel
EXCAVATORS

ARMCO INGOT IRON

—*the longest record of actual service...*

Memorial Civic Auditorium, Stockton, California. Architect, Glenn Allen. ARMCO Ingot Iron used for ribbed seam roofing, cornices, and general sheet metal work throughout the building.

SIGNIFICANT it is to engineers that ARMCO Ingot Iron possesses the *longest record of actual service* of any low-cost, rust-resisting sheets and plates. This twenty-two year service record comprises sheet and plate installations of many kinds, exposed to various corrosive conditions. Roofing and siding, tanks, stacks, breeching—these are but a few.

You will want to consider time-proved ARMCO Ingot Iron when you specify sheets or plates. Consider it, too, in terms of reduced maintenance—lower cost per year of service. Look for the ARMCO triangle.

An ARMCO Development Engineer will gladly assist. Just communicate with the office nearest you.

Here the famous ARMCO CONCERT BAND, every Tuesday night, WLW—700K—Cincinnati, Ten to eleven E.S.T.

Back of this familiar symbol is nearly thirty years experience in the manufacture of special analysis, iron and steel sheets and plates. When you seek a rust-resisting, low-cost metal be sure to see this triangle and the words "ARMCO Ingot Iron." It is your assurance of dependable economical service.

THE AMERICAN ROLLING MILL CO.

Executive Offices, Middletown, Ohio

Export: The ARMCO International Corporation

DISTRICT OFFICES: Chicago, Cincinnati, Cleveland, Detroit, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco

wait

1930
CONVENTION &
ROAD SHOW
A.R.B.A.
ATLANTIC CITY N.J.
JAN. 13-18

Before you buy another shovel, dragline, crane or drag shovel, let a Lima sales engineer tell you all about the LIMA "101" or—if you can—wait until you see it at the Road Show.

Since the LIMA "101" was first exhibited at the last Road Show, it has made astonishing records from coast to coast in production and low maintenance cost in every industry where excavators are used.

LIMA "101" still leads the field in advanced principles, design and construction, and by its superior performance alone has become the most popular excavator of its size on the market.

The Ohio Power Shovel Co.
Division of Lima Locomotive Works Incorporated
Lima, Ohio

Eastern Office
2351 Graybar Bldg.
New York

Western Office
846 Straus Bldg.
Chicago

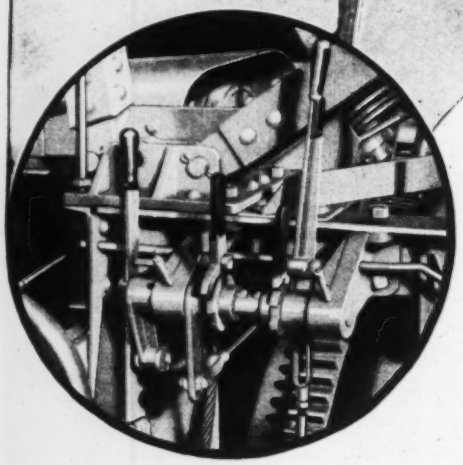
LIMA "101"

The only Shovel in the world equipped throughout with roller bearings—a Timken at every vital bearing point.

LIMA "101"

The MULTIFOOTE *power operator*

AUTOMATIC CONTROL *plus the* BRAINS *of the operator*



THE MultiFoote Power Operator permits taking advantage of every fraction of a second. There is no delay discharging because the next load of aggregate isn't in the skip as is often the case with a mechanical mixing cycle and when the load is in ahead of time the skip can be raised and held ready for the batchmeter bell.

The power operator starts the skip and turns on the water by power. It takes but a touch of the little finger on the lever and presto—action starts instantly giving the clipped second speed that comes with power operation—but at the correct moment.

See this new MultiFoote device. Let us tell you more about it.

THE FOOTE COMPANY, Inc.
of Nunda, N. Y.

WORLD'S LARGEST EXCLUSIVE BUILDERS OF ROAD PAVERS

Frank E. Hall
152 W. 42nd St., New York City
E. J. McHarg & Co.
31 Crestmont Rd., Binghamton, N. Y.
Wilcox Brothers
588 Chenango St., Binghamton, N. Y.
Burton Franklin
Chattanooga, Tenn.
Manufacturers Road,
Edward R. Bacon Company
Folsom at 17th St., San Francisco, Calif.
Multifoote Sales Company
2811 West Fulton St., Chicago, Ill.

VISIT
BOOTH 211

See the
1930
MULTIFOOTE
PAVER

1930
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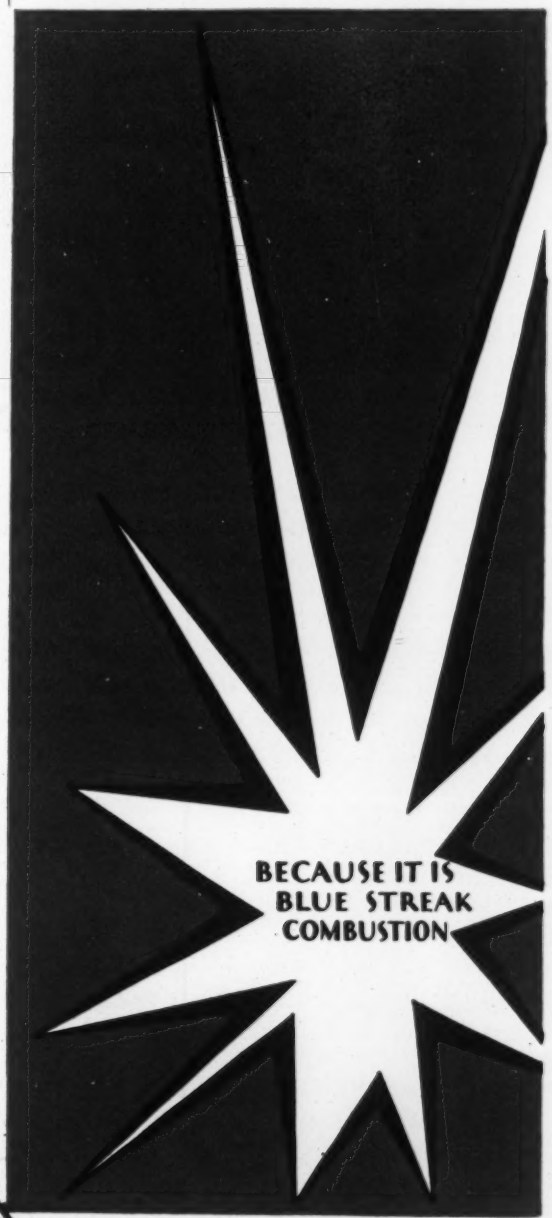
ATLANTIC CITY N.J.
JAN. 13-18

IT'S BILL'S BREAD AND ... BUTTER



To many people, it was just another engine—but to Bill it was extraordinary. The gray painted engine with the Blue Streak, located back of him in the cab, "talked" at every command. It pulled down to low speed with wide open throttle without "knocking" and she didn't stall. From years of experience, Bill knew there was a lot more power than on other gasoline jobs he had owned—and he was equally surprised at the low amount of fuel it consumed. Bill's all "hepped up" over his Blue Streak engine, and he has a right to be—it's his bread and butter.

CLIMAX ENGINEERING COMPANY
72 West 18th Avenue :: :: Clinton, Iowa

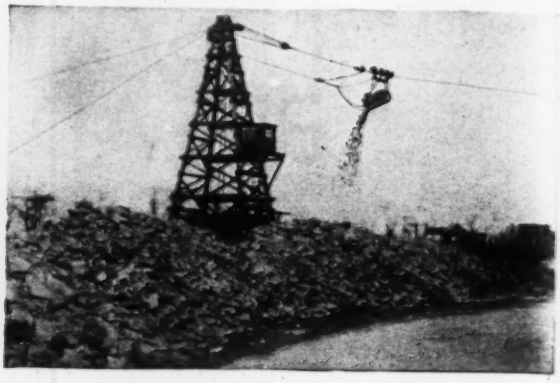
Blue Streak

AMERICAN ROAD BUILDERS' ASSOCIATION
1930 CONVENTION AND ROAD SHOW
JAN. 13–18
ATLANTIC CITY NJ

CLIMAX

Trade Mark Reg. U. S. Pat. Office.

Digging a Water Storage Reservoir



Removing Blasted Rock From Canal

Long Range Excavating Simplified

YOU can handle cut and fill work, levee building, dam construction, etc., with a minimum outlay by using a Sauerman Slackline Cableway. On many excavating jobs you can reduce your cost one-half.

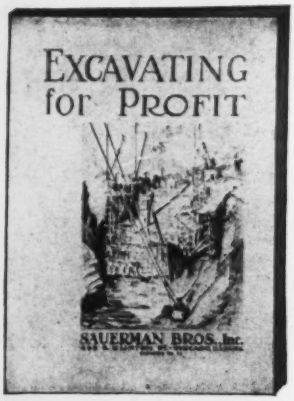
A Sauerman Slackline Cableway does the combined work of excavating, elevating and hauling equipment. It digs, elevates and conveys to bin, spoil pile or car in one continuous operation.

Your initial cost for a Sauerman Slackline Cableway is much less and your maintenance costs are low in comparison with any other excavating and conveying equipment that is capable of rendering an equal amount of service.

Furthermore, a Sauerman Slackline Cableway only requires one man for operating.

Another advantage of this machine is that it can be moved easily from one job to another. It is a simple machine, can be handled quickly in transit, and can be set up with little loss of time.

Sauerman Slackline Cableways are manufactured in a great number of sizes, with operating spans ranging from 200 to 1,200 ft. and handling capacities from 10 to 300 tons per hour. Furnished with electric, gasoline, steam, or Diesel driven power units.



All the improved mechanical details of Sauerman Slackline Cableway Excavators are treated fully in a new 56-page Catalog, which also describes and illustrates the many ways in which this equipment has been utilized for excavating work of all kinds, ranging from the ordinary problem of producing concrete aggregates up to the large engineering projects which require the moving of thousands of cubic yards of earth and clay per day. Ask for Catalog No. 12.

1930
CONVENTION &
ROAD SHOW
A. R. B. A.
ATLANTIC CITY N.J.
JAN. 13-18

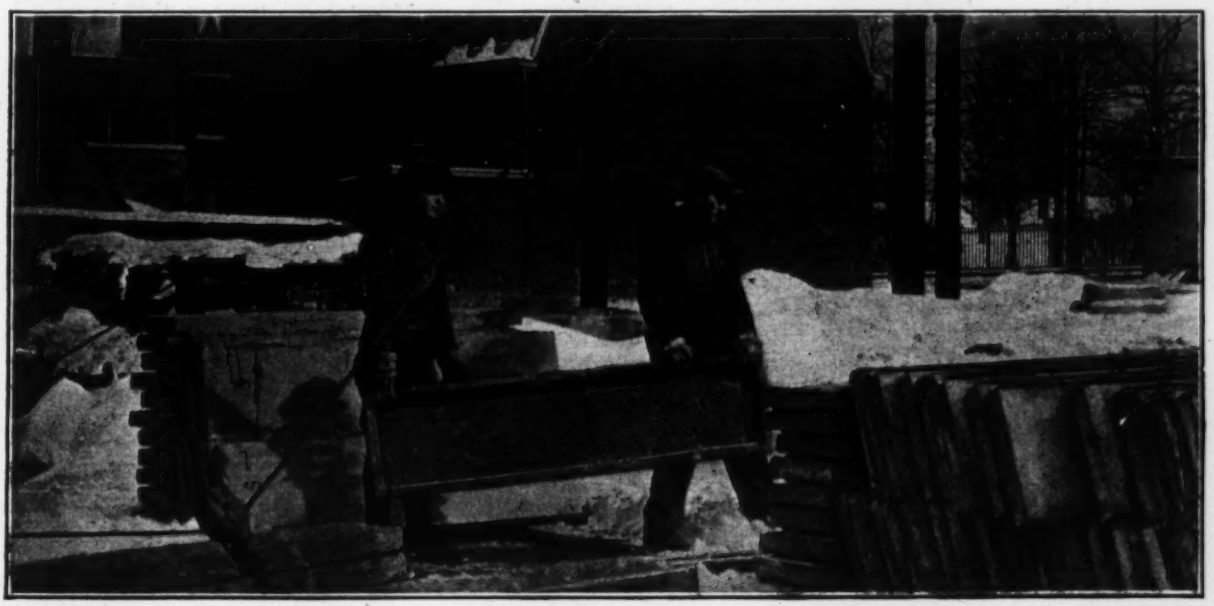
SAUERMAN BROS., Inc.
432 S. Clinton St.
Chicago

Winter Never Delays Cementile Roof Installations

THERE is no danger of cracking, shrinking, leaks or other winter roofing troubles when Cementile is used. These specially designed precast roof slabs of steel-reinforced concrete—can be laid as easily, as speedily and as satisfactorily on the coldest days as in summer. Cementile makes the most weatherproof roof that can be installed. Because of its impregnable and durable qualities, no painting, repairs nor maintenance of any kind is ever needed. Because of its lasting strength and efficiency it proves the lowest cost permanent roof obtainable. Let our engineers study your roofing problems and suggest an economical installation of one of the three styles of Cementile—Channel (illustrated here), Flat, or Red Interlocking. Write for a catalog showing Cementile roofs that have been laid on buildings of industries similar to yours, in various parts of this country.

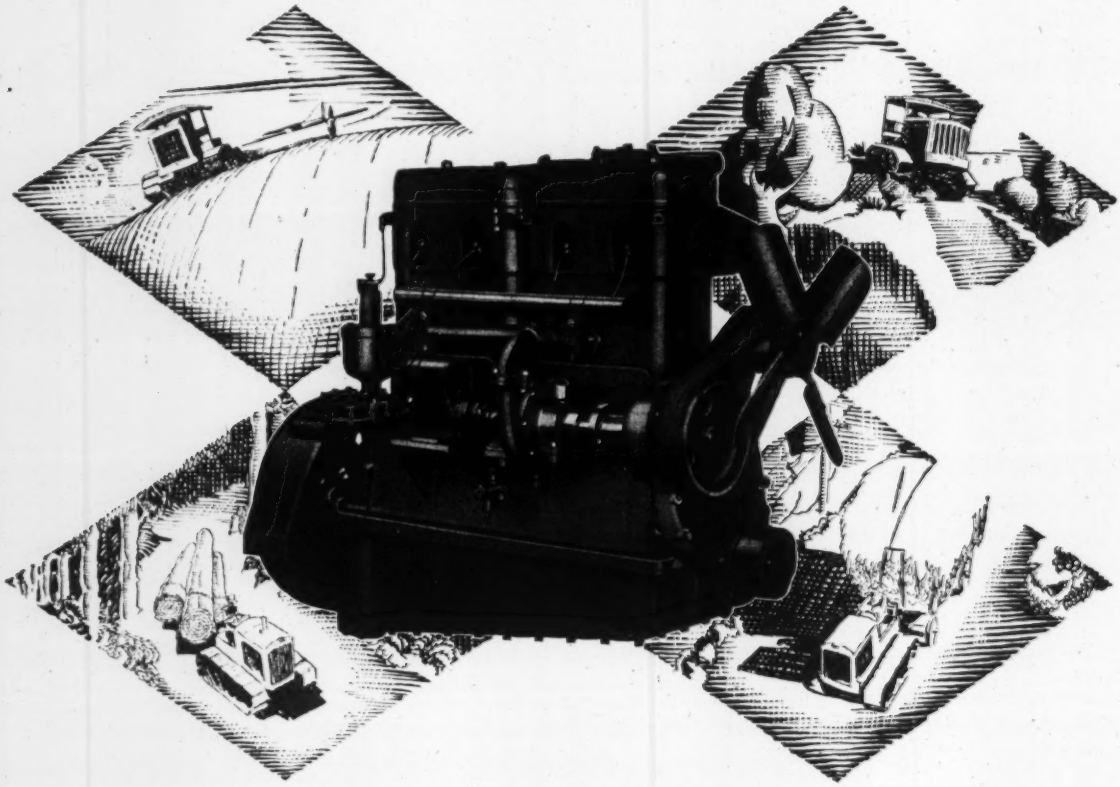
AMERICAN CEMENT TILE MANUFACTURING CO.
802 OLIVER BUILDING, PITTSBURGH, PA.

Plants: Wampum, Pa. Lincoln, N. J. Birmingham, Ala. *Offices:* Pittsburgh New York Philadelphia Atlanta Birmingham



LE ROI

For Dependable Power



Why Le Roi Has Wide Acceptance

1

Le Roi Engines cost less to operate and maintain.

2

Le Roi Engines have "oversized" parts for greater power.

3

Le Roi Engines have a foolproof system of lubrication.

4

Le Roi Engines stay "active" longer.

5

Le Roi Engines are built by experienced and successful Engine Builders.

THE Le Roi Model "JA" is rugged . . . dependable . . . powerful. From every standpoint, the ideal heavy-duty engine. It is of the valve-in-head design, which gets the maximum power out of every explosion. "Oversized" working parts and vibrationless operation, and a fool-proof lubrication system assure dependable service over a long period of time. ***Write for special bulletin.***

LE ROI COMPANY, ***Milwaukee, Wis.***

1930—Road Show—Atlantic City

LE ROI ENGINES

3 *to* 180 HORSE POWER

Plan *now* . . .

for

Water Well Supply

Should you contemplate increasing your water supply, installing a new well system or changing the method of pumping, wouldn't it be more satisfying to plan now and have the work completed at the opportune time, than to delay and possibly regret it later?

The LAYNE organization, the largest exclusive water developers in the world has the experience, equipment and ability to locate and develop a water well that, when equipped with a Layne Pump, will effect economies and result in lasting satisfaction and dependability.

It will pay you to send for bulletins.

Layne & Bowler, Inc.

MEMPHIS TENNESSEE

NEW YORK
NORFOLK
BIRMINGHAM
PARIS, FRANCE
MILWAUKEE
CHICAGO
STUTTGART
KANSAS CITY
COLUMBUS
LAKE CHARLES
BUENOS AIRES, S. A.
HOUSTON
SOUTH BEND
TORONTO

LAYNE

MORRIS
CENTRIFUGAL PUMPS

There is no operator in this picture

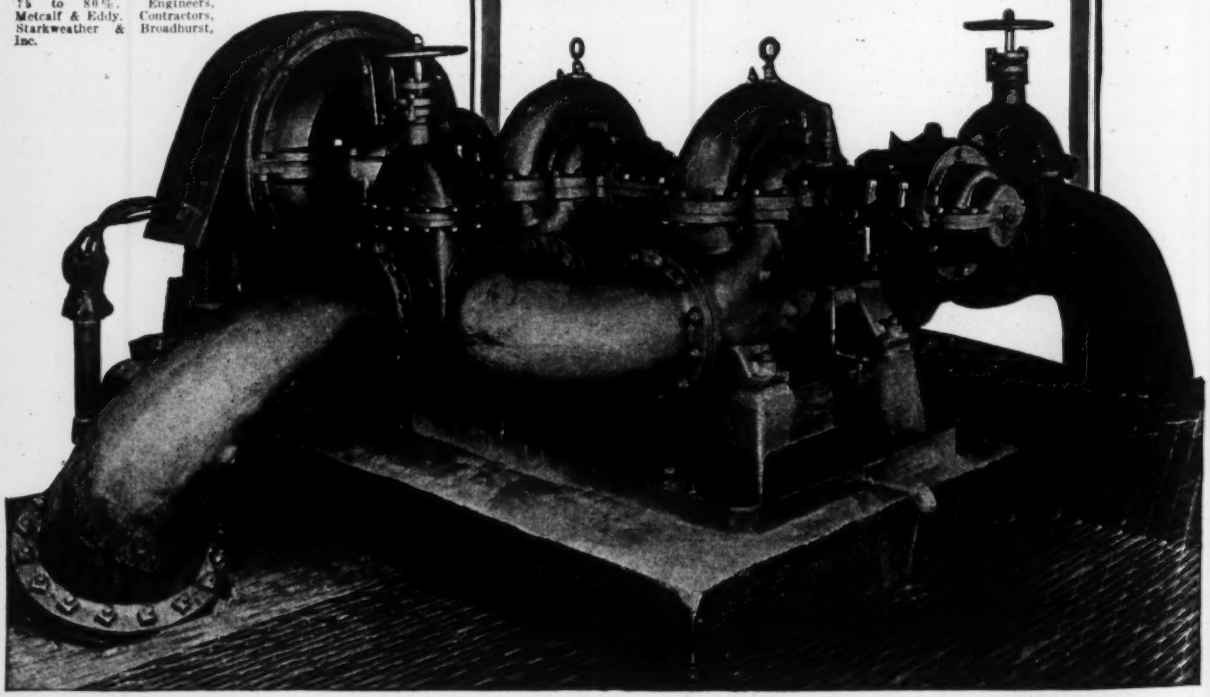
THIS illustration of a typical Morris Water Works Centrifugal Pump installation does not include an operator because Morris Pumps so rarely require attention. Their exceptional hydraulic balance, substantial bearings and sturdy construction in every detail can be thoroughly depended upon to provide long continued operation at high efficiency and low maintenance expense. These Morris Centrifugal Pump characteristics, secured by several distinctive features of design, have won the hearty approval of water works engineers and superintendents all over the country.

In sewage disposal plants, too, Morris Non-Clogging Pumps operate with uniform regularity, capable of handling rags, sticks, and other solid material without danger of clogging or breakage. Whatever your pumping needs may be, investigate Morris Centrifugal Pumps. The 65-year experience of the pioneer American Centrifugal Pump manufacturer is at your disposal without charge or obligation, and is sure to be of value to you in assuring an exactly suitable pumping unit for your requirements.

Morris Machine Works
Baldwinsville, N. Y.

Branch Offices: **— New York, Philadelphia, Cleveland, Chicago, Boston, Pittsburgh, Detroit, Charlotte**

High Service Pumping unit at Watchung Avenue Station, Montclair, New Jersey. Capacity 4 m.g.d. against 350 ft. total head at 1,780 r.p.m.; combined efficiency of motor and Morris Centrifugal Pumps 75 to 80%. Engineers, Metcalf & Eddy. Contractors, Starkweather & Broadhurst, Inc.



LOOK FOR THE L B SIGN AT THE ROAD SHOW

You'll have a real surprise at Booth 507-521. A brand new Asphalt Kettle that is unlike any you have ever seen—it's a hot outfit for maintenance work. Remember, under the L B sign at the A.R.B.A. Road Show—Booth Nos. 507-521.

LITTLEFORD BROS.

415 E. Pearl Street *Cincinnati, Ohio*

LITTLEFORD

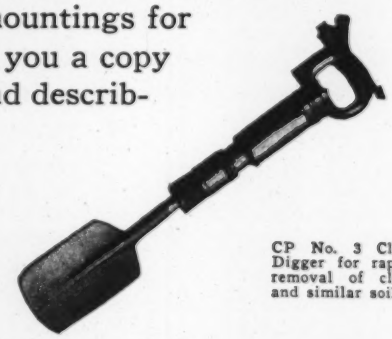
ROAD & STREET MAINTENANCE EQUIPMENT

Let a CP Portable Air Compressor do the HARD Work

WHEN you have pavement breaking, rock drilling, clay digging, backfill tamping or demolition work to do (back-breaking, time-killing work if done by hand) take a smooth-running CP Portable to the job. It can easily and quickly be moved wherever wanted and will furnish a constant supply of compressed air for time-and-labor-saving pneumatic tools. Available in five sizes—110, 160, 220, 265 and 310 cu.ft. free air per minute—and suitable mountings for every requirement. May we send you a copy of Bulletin No. 797 illustrating and describing CP Portables?

CP-116 Demolition Tool for tearing out foundations, walls, cutting and breaking pavement, etc.

CHICAGO PNEUMATIC



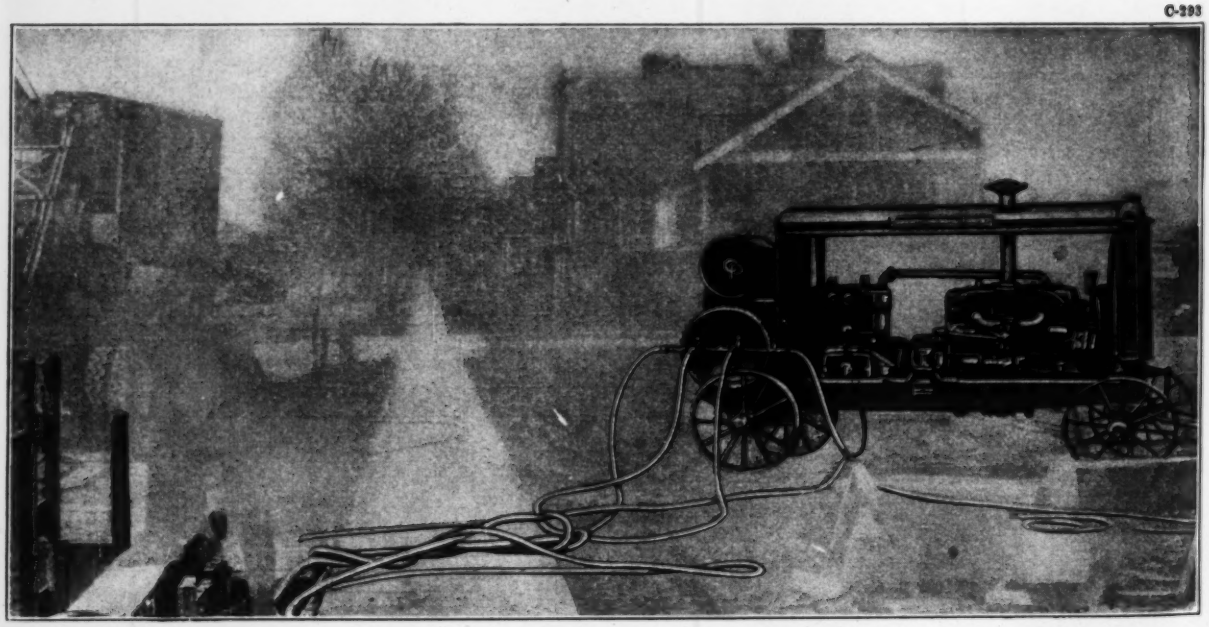
CP No. 3 Clay Digger for rapid removal of clay and similar soil.

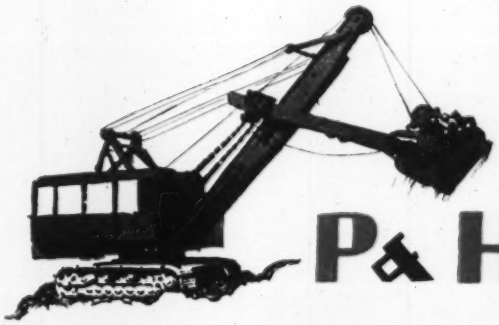
Chicago Pneumatic Tool Company

General Offices: 6 East 44th St., NEW YORK

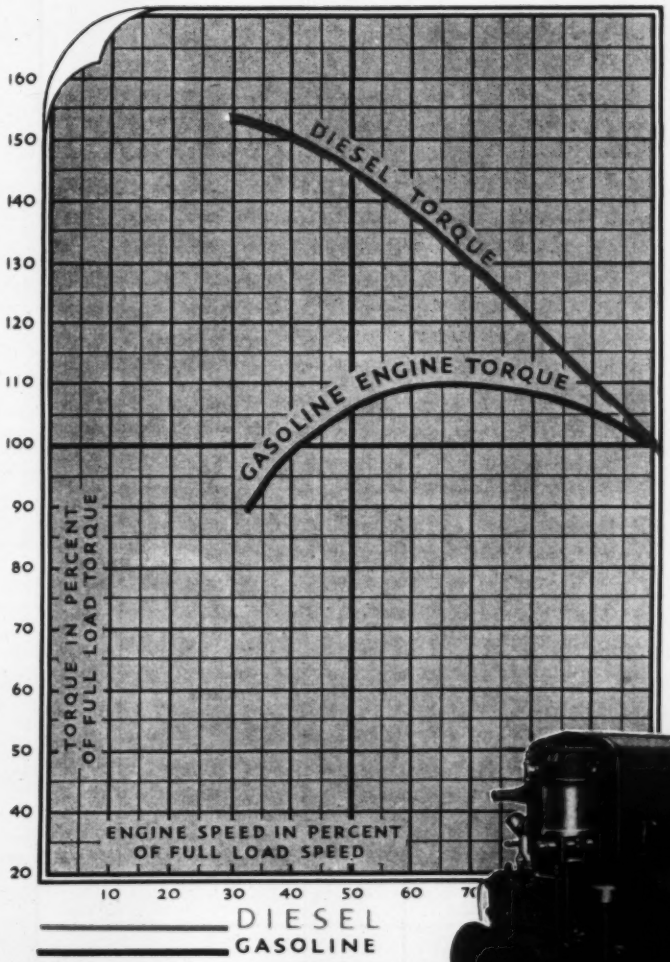
Sales and Service Branches all over the World

C-293





Why P & H Diesel Shovels *cut through* where others STALL—

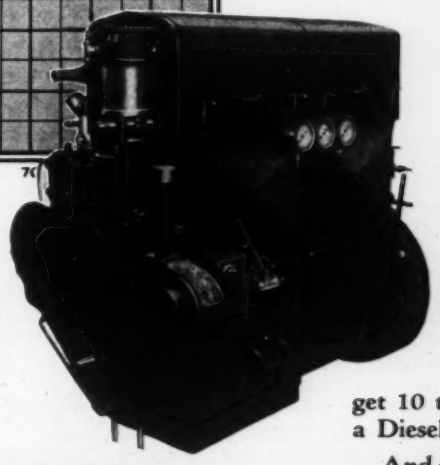


AMERICAN ROAD BUILDERS' ASSOCIATION 1930 CONVENTION AND ROAD SHOW JAN. 13-18 ATLANTIC CITY N.J.

IN hard, tough digging—rock, hard-pan, gumbo, coarse shale—your shovel must work. The engine is frequently slowed down to low speeds.

And that is where the pinch comes. At very low speeds all internal combustion engines, except the Diesel, begin to stall. Their torque goes 'way down.

But the Diesel engine, even when slowed down below 50% of normal speed, increases its torque. It takes a more determined hold—gives you more power when you need it.



The graph illustrates the difference between a Diesel and a typical gasoline engine. It shows why the Diesel "hangs on" and cuts through where other engines stall. It explains why you can get 10 to 15% more yardage from a Diesel Shovel than from others.

And don't forget that in addition the Diesel saves from 75 to 85% in fuel costs as compared to gasoline.

For complete details of the P & H Diesel Excavator, write the HARNISCHFEGER CORPORATION, 3804 NATIONAL AVENUE, MILWAUKEE, WIS.

10071

P & H

Diesel

SHOVELS

¾ TO 3½ CU. YDS.

Mile after mile—

[of unwrinkled concrete,]

through the heart of TENNESSEE

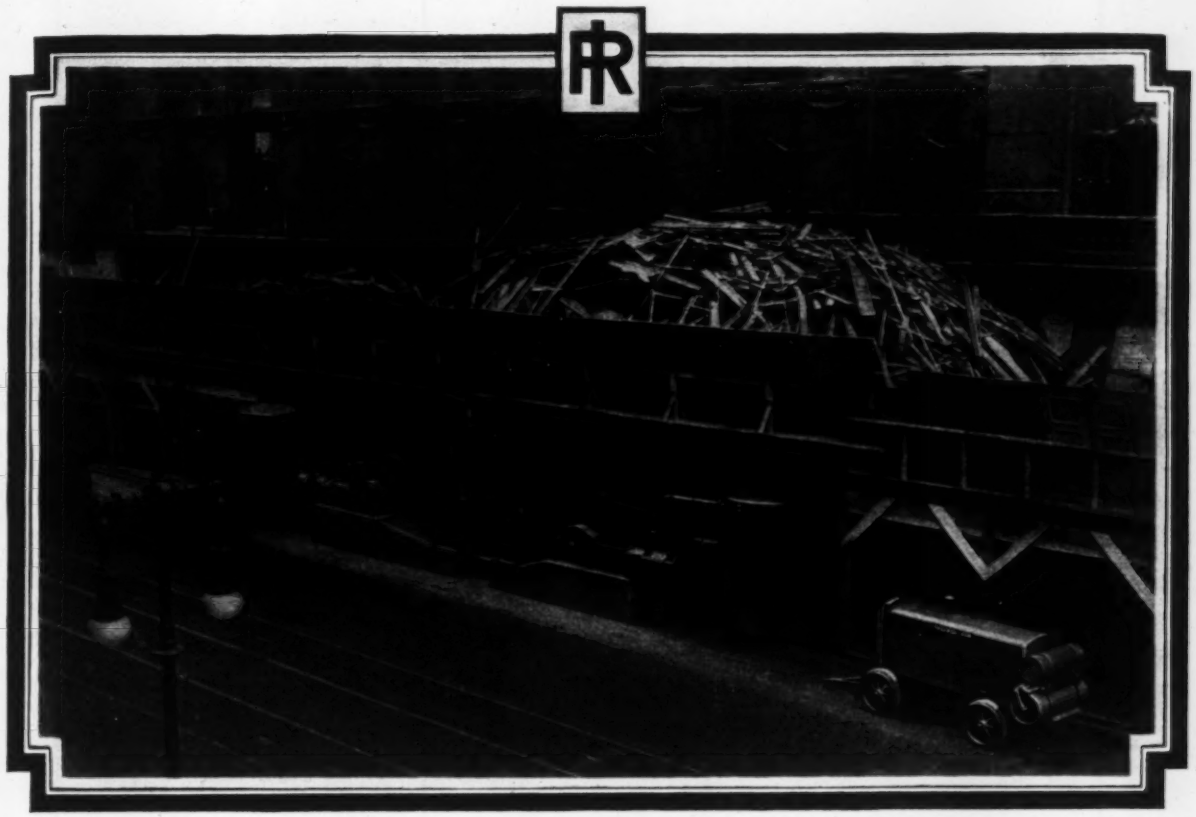
A section of the concrete Dayton Pike, through Southern Tennessee. Carey Elastite Expansion Joint, installed transversely at frequent intervals, keeps the road smooth and prolongs its life.

A revelation to motorists, the inviting expanse of white concrete that ribbons through Hamilton County, in Southern Tennessee. One of the finest, smoothest roads in the South, because "shock absorbers" are *bonded right into the concrete.*

Carey Elastite Expansion Joint! It compresses readily under pressure—protects concrete against seasonal strains and prolongs its life. The water-tight, frost-tight sandwich joint, extensively used and recommended by leading engineers and contractors in every State in the Union. Manufactured by a company who has been in business over fifty years—pioneer makers of expansion joints. Write for particulars about modern installation methods.

Carey Elastite EXPANSION JOINT

THE PHILIP CAREY COMPANY, *Lockland*, CINCINNATI, OHIO



A corner of the Waldorf-Astoria as demolition work began

The Waldorf Passes

The Waldorf-Astoria, once the proudest of New York's fine hostelries, has given way to the wrecking crew! A traditional landmark for almost half a century, this fine old edifice will shortly give place to a building of more modern design.

In considering equipment for the demolition and construction work, Starrett Brothers, Inc., New York contractors, selected Ingersoll-Rand compressors, air receivers, and demolition tools. This outfit, a portion of which is illustrated above, consists of two 20 and 12½ x 16 XCB Compressors, one 10 x 8 portable compressor, two air receivers, and numerous "Jackhamer" drills and paving breakers. Although photographed before installation was complete, the compressor plant is now delivering its full capacity.

Ingersoll-Rand machines will be found on most of the big construction and demolition jobs. Our extensive line of compressors, air tools, and allied equipment make it possible to install an outfit that will suit the individual contract. When figuring your next compressor layout, ask an I-R engineer to supply full cost and operating data.

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Whether your reinforcing problem is one of intricacy of design, large or small tonnage, special service, or one of limited time, the special Contractors and Builders Division of Ryerson Steel-Service can usually save you time and money.

The unparalleled range of steel building products carried in stock, combined with all the facilities of the world's largest steel-service organization, offers unusual advantages.

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Send in your blue prints and let our engineers go over them. They can usually make suggestions that will save you money.

Ryerson Steel Service includes everything for reinforcing concrete; all steel building products such as expanded metal, joist, metal lath, etc.; also all general steel items such as beams, bars, rails, bolts, rivets, etc.; and many tools required on every job including electric drills, chain hoists, jacks, etc. Write for our catalog, "Steel Products for Contractor and Builder."

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STEEL-SERVICE

CONSTRUCTION NEWS

Some of the Week's Large Projects

BRIEF mention of some of the notable projects of the week will be found below. For further details on any project turn to the appropriate part of this section and read the report.

PROPOSED WORK

Grade Crossing Elimination, New York, Public Service Comn., Albany, $12,000,000.

Steel Plant, Cleveland, O., Otis Steel Co., $10,000,000.

Sewers, Los Angeles, Calif., White Point Outfall Sewer, $7,000,000.

Railways, Pennsylvania, Philadelphia & Reading R.R. Co., C. Dillenbeck, ch. engr., Phila., $5,808,000.

Ship, Prince Edward Island, Prince Edward Island Car Ferry, $2,000,000.

School, Chicago, Ill., University of Chicago, sketches, $2,000,000.

Railways, Ohio, Norfolk & Western Ry. Co., W. P. Wiltsee, ch. engr., Roanoke, Va., expending $1,600,000.

Exchange, etc., Louisville, Ky., Southern Bell Telephone & Telegraph Co., $1,500,000, total $5,000,000.

Waterworks, Flint, Mich., $1,500,000.

Factory, New York, N. Y., One Hundred 6th Ave. Corp., and V. Green, $1,300,000.

Sewers, Long Beach, Calif., $1,200,000.

High School, Topeka, Kan., Bd. Educ., soon takes bids, $1,100,000.

Stores, Los Angeles, Calif., G. W. Teague, Cleveland, O., $1,000,000.

Office, New Brunswick, N. J., J. L. Mott, Brooklyn, N. Y., $1,000,000.

BIDS ASKED

Office, Portland, Ore., Bennes & Herzog, archts., take bids about Feb. 10, for J. E. and E. O. Blazier, $2,000,000.

Public Bond Elections, coming and decided, are listed on Construction News page 294.

Bridge, Phila., Pa., Dec. 27, by Dpt. P. Wks., $1,700,000.

High School, Schenectady, N. Y., Jan. 8, by Bd. Contract & Supply, (selected list bidders), $1,200,000.

Hall of Records, Paterson, N. J., Bd. Freeholders Passaic Co., bids about Feb. 1, $1,000,000.

CONTRACTS AWARDED

Schools, Cincinnati, O., Bd. Educ., excavation to Roos-Yeyer-Hecht Co.; brick and stone to David Hummell Co., and balance of work to David Gordon Constr. Co., est. $1,207,213.

Paving, Ohio, R. N. Waid, dir. Hys., Columbia, to Highway Constr. Co., Cleveland, $1,025,988.

Auditorium, Pittsburgh, Pa., Albert H. Kahn, Inc., archts., Detroit, Mich., to George A. Fuller Co., Washington, D. C., for H. J. Heinz Co., total est. $1,000,000.

Apartment, Baltimore, Md., Investment Constr. Co., A. Hunt, in charge, separate contracts, $1,000,000.

Hospital, Baltimore, Md., Johns Hopkins Hospital, to Consolidated Eng. Co., $1,000,000.

Construction News of the Week

WATERWORKS

PROPOSED WORK

Calif., San Francisco—City, motor-driven centrifugal pump with auxiliary engine in Mills Municipal Airport, $7,000. M. M. O'Shaughnessy, city engr.

Mich., Flint—City, 1 and 2 story, rein.-con., brick, steel, stone pumping station, incl. equipment, appurtenances, $1,500,000. Hoad, Decker, Shoefraft & Drury, Ann Arbor, engrs. Noted Apr. 4.

N. Y., Brooklyn—Bd. Water Supply, Municipal Bldg., New York, plans by C. J. Griffin, Boro Hall, 1 story, 21 x 33 ft., steel, concrete pumping station, Avenue Z, Bragg and Knapp Sts., $100,000.

BIDS ASKED

Calif., Los Angeles—Jan. 6, by Supervs. Los Angeles Co., 4- to 10-in. c.i. pipe, Miramonte Park, in Co. Water Works Dist. 16.

O., Berea—Dec. 28, by J. J. Rooney, clk., Berea, 300,000 gal. steel water tank.

CONTRACTS AWARDED

Mich., Detroit—D. C. Grobell, secy. Dpt. Water Supply, rein.-con., brick wash water building at Springwells Water Sta., to W. H. Mueller, Co., 2111 Woodward Ave., $32,000; electrical equipment for pump operation, to Long Electric Co., 403 Morgan Bldg., $16,850. Noted Dec. 5.

Mich., River Rouge (br. Detroit)—Ford Motor Co., 3674 Schaefer Rd., Dearborn, water intake, rein.-con., brick screen house for water supply tunnel for power plant, on Detroit River, to J. W. Butler Constr. Co., Free Press Bldg., Detroit. Est. $25,000. Noted Nov. 7.

Minn., Minneapolis—F. S. Gram, city purch. agt., 3 mi. 42 and 48 in. steel pipe, to East Jersey Pipe Co., 7 Dey St., New York, $184,935. Noted Dec. 5.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Avenue T, Cleveland St., to Bruno Costanzo, 2777 Myrtle Ave., $6,970. Noted Dec. 5.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Bourck, Burr Aves., to Sareno Contg. Co., 1959 Colden Ave., $15,460. Noted Dec. 5.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in 3rd, 4th, 6th Aves., to Knight & DeMicco, 448 East Tremont Ave., $49,390. Noted Nov. 14.

O., Columbus—W. H. Duffy, dir. Serv., elevated steel tanks, and appurtenances for Waterworks Dpt., to Pittsburgh-Des Moines Steel Co., Newell Island Branch P. O., Pittsburgh, Pa., $89,450; foundation for same, to P. Sloop, Columbus, $7,350.

Ont., Windsor—Essex Border Utilities Comn., extending mains in Randolph St., day labor under supervision J. C. Keith, engr., c/o owner; c.i. pipe, to National Iron Corp., Cherry St., Toronto, $25,000; meters, to Neptune Meter Co., 345 Sorauren St., Toronto, $600; valves, to Kerr Engine Wks., Walkerville, $2,500. Noted Nov. 14.

SEWERS

PROPOSED WORK

Calif., Long Beach—Independent sewerage system, disposal plant, $1,200,000. H. Paterson, city sanitary engr.

Calif., Los Angeles — White Point Outfall Sewer, 5,000 lin.ft. 6 to 8 ft. inside diam. pipe in tunnel, $7,000,000. A. K. Warren, Sanitation Dpt., engr.

Mich., St. Clair Shores—Village pumping station, 20,000 ft. 4½ ft. to 9½ ft. cylinder monolithic concrete sewer in Eleven Mile Rd. $700,000. Hubbell, Hartgering & Roth, 2640 Buhl Bldg., Detroit, engrs. G. J. Haas, 601 East Grand Blvd., Detroit, archt. in charge of design.

Mo., Ferguson—St. Ferdinand Sewer Impvt. Dist., St. Ferdinand Twp., St. Louis Co., preliminary plans combination sewers in 12,000 acre tract, $2,500,000. Hancock Eng. Co., 6228 Easton Ave., Wellston, engrs. Noted Oct. 3.

N. Y., New York—J. Miller, pres. Manhattan Boro, Municipal Bldg., rejected bids Dec. 10, sewer in 7th Ave. Noted Dec. 5.

THESE reports are grouped under each class (water-works, sewers, etc.) and under each stage of the work (proposed, bids asked, etc.) according to the alphabetical order of states.

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk, or corresponding official.

N. C., Greensboro — City, bids about latter part January sewage disposal plant on Buffalo Creek, $300,000. C. W. Smedbury, supt. Water Dpt. Noted Dec. 5.

BIDS ASKED

Ill., Chicago — Jan. 2, by H. E. Hoff, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., North Branch Sewage Pumping Station, Div. "CC," incl. 5 electric motor gate valve operating units, wiring, piping, etc.

Miss., Hattiesburg—Jan. 21, by City, 45 mi. 6- to 36-in. sanitary sewers, $400,000. H. S. Pickernell, City Hall, engr.

N. Y., Brooklyn—Jan. 3, by J. J. Byrne, pres., Brooklyn Boro, Boro Hall, sewer in 23rd Ave., West 1st, East 45th, East 59th and Gem Sts.

N. Y., Long Island City—Dec. 30, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewer in Laurel Hill, Bell and Baisley Blvds., 52nd Dr., 21st, 35th, Griffin, 108th, 114th, 123rd and Hollis Aves., Garfield, LaFarge, 143rd, 147th, 191st, 198th, 208th and Beach 35th Sts.

N. Y., New York—Jan. 3, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Vincent, Philip, Quincy and Baychester Aves.

N. Y., Yonkers — Jan. 10, by Westchester County Sanitary Sewer Comn., Court House Annex, White Plains, Sect. B, South Yonkers Project under Sunnyside Dr., extending from Pier St. to sewer in Valentine Lane; adv. E. N.-R. Dec. 26.

O., Springfield—City Manager bids about Feb. 20, combined storm and sanitary sewer in Fostoria Ave. $70,962.

CONTRACTS AWARDED

N. Y., Mount Kisco—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, filter beds, appurtenances at Mount Kisco Sewage Disposal Plant, to M. Delfino, 9 North Highland Ave., Ossining, $82,900. Noted Dec. 5.

N. Y., New York—J. Miller, pres. Manhattan Boro, Municipal Bldg., sewer in New St., to Murphy & Richman, Inc., 50 Court St., Brooklyn, $39,329. Noted Dec. 5.

N. Y., Syracuse—Bd. Contr. & Supply, City Hall, sewers in Mark, West Beard and McLenna Aves., to Mondo Constr. Co., 417 South Townsend St., $28,847.

BRIDGES

PROPOSED WORK

Calif., Los Angeles—Comrs. Los Angeles Co., two 42 ft. rein.-con. girder spans, 70 ft. roadway, two 8 ft. sidewalks over Alhambra Wash, San Gabriel Blvd., $45,000—98 ft. arch span bridge, 70 ft. roadway, two 8 ft. sidewalks over Alhambra Wash, Garvey Ave., $26,000—two 30 ft. concrete girder spans, 74 ft. roadway, two 7 ft. sidewalks over Eaton Wash, Pomona Blvd., $35,000. W. D. Armstrong, Hall of Records Bldg., engr.

Calif., San Francisco—Golden Gate Bridge & Hy. Dist., single span, 4,400 ft. (not incl. approaches) bridge across Golden Gate from Fort Point to Lime Point, incl. 2 water pier locations, 2 land anchorage sites, about 6 diamond borings at each pier site. Strauss Eng. Corp., 307 North Michigan Ave., Chicago, Ill., designers and chf. engrs. Noted Nov. 14.

Ill., Chicago—South Park Comrs., 5700 Cottage Grove Ave., 250 ft. steel viaduct encased in cement, 100 ft., at 35th St. $500,000. L. White, 5700 Cottage Grove Ave., engr.

Louisiana—State Hy. Comn., Baton Rouge, received no bids Dec. 10, bridges Project 540C, Route 83, LaFourche and St. James Parishes. Noted Dec. 5.

Missouri—See "Railways."

Missouri and Arkansas—See "Railways."

O., Troy—Miami Co. 2 span 312 ft. steel hy. bridge over Miami River, on Ross Pike, $30,000. E. H. Bagford, Troy, co. engr.

Pennsylvania—See "Railways."

BIDS ASKED

Ind., Kokomo—Jan. 7, by Comrs. Howard Co., 4 span, steel, concrete girders, Ohio Ave. Bridge, $100,000. W. E. Ehrman, Kokomo, engr.

Iowa—Jan. 7, by State Hy. Comn., Ames, 50 x 20 ft. pony truss, two 110 x 20 ft. high truss and 40 x 24 ft. I-beam bridges, 63 culverts and

See proposal advertising on page 97

Constr. News page 293

LEADITE

Trade Mark Registered U.S. Pat. Office

These 14 Users *alone* have laid 1,836.83 Miles of Water Mains —*jointed with* LEADITE

	Miles	
Crumley, Jones & Crumley Company	200.00	4-in. to 36-in.
Dayton, Ohio	128.25	4-in. to 84-in.
Flint, Michigan	237.41	4-in. to 30-in.
Ft. Worth, Texas	192.85	4-in. to 36-in.
Indianapolis Water Company	150.00	6-in. to 36-in.
Louisville Water Company	165.82	Up to and including 48-in.
New Bedford, Mass.	25.00	4-in. to 48-in.
Oklahoma City, Oklahoma	94.50	6-in. to 30-in.
Pennsylvania Water Company	110.00	4-in. to 42-in.
Philadelphia Suburban Water Co.	230.00	Up to and including 24-in.
St. Louis, Missouri	90.00	Up to and including 36-in.
Standard Paving Co., Inc. of Tulsa, Okla.	26.00	24-in. to 36 in. incl.
City of Tulsa, Oklahoma	37.00	6-in. to 36-in.
Washington Suburban San. Dist.	150.00	Up to and including 24-in.

When it is considered that this large quantity of LEADITE Jointed Bell and Spigot Water Mains was laid by only 14 Users,—some idea may be had of the huge total mileage laid by "all" LEADITE Users.

The Pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%

THE LEADITE COMPANY
Land Title Building Philadelphia, Pa.

No Caulking

Bridges (Continued)

extensions on Rd. 13, B-594, Allamakee Co.—70 x 20 ft. pony truss bridge with two 32 x 20 ft. I-beam approaches, three 20 x 24 ft. I-beam spans, 11 culverts and extensions, Rd. 71, B-52, Audubon Co.—40 x 20 ft. I-beam bridge, adding three 32 x 19 ft. I-beams to present bridge, Rd. 10, B-483 and 22 x 18 ft. slab bridge, 1 culvert, Rd. 10, F. A. B. 88, Bremer Co.—raising 16 x 24 ft. slab brdige, Rd. 32, F. A. B. 44, Cass Co.—32 x 24 ft. I-beam bridge, 29 culverts and extensions, Rd. 18, B-639, Fayette Co.—60 x 20 ft. and 80 x 20 ft. pony truss bridges, 14 culverts, Rd. 90, Grundy Co.—16 culverts and extensions, Rd. 149, B-245, Keokuk Co.—60 x 20 ft. and 40 x 24 ft. pony truss bridges, 40 x 20 ft. I-beam bridge, 8 culverts and extensions, Rd. 32, B-635, Muscatine Co.—1 culvert, Rd. 32, F. A. B. 261, Poweshiek Co.—40 x 20 ft. I-beam bridge, 70 x 20 ft. pony truss with two 32 x 20 ft. I-beam approaches, 15 culverts and extensions, Rd. 7, B-42, Shelby Co.—140 x 20 ft. high truss bridge with two 40 x 20 ft. I-beam approaches, raising one 24 x 20 ft. and one 32 x 20 ft. I-beam bridges, Rd. 59, F. A. B. 47, Tama Co. R. F. White, hy. comr.

Kansas—Jan. 7 (extended date), by State Hy. Dpt., at Courthouse, Columbus, one 140 ft. and two 110 ft. span truss or arch bridge, U. S. Hy. 73-E, Cherokee Co. W. V. Buck, Topeka, Hy. engr.

N. J., Newark—Jan. 2, by Bd. Freeholders Essex Co., Court House, repairing flooring, altering Clay St. Bridge over Passaic River, $25,000. W. H. Stickles, Hall of Records Bldg., co. engr.

N. Y., New Castle—Jan. 6, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, rein.-con. bridge over Putnam Div. New York Central R.R. at Echo Lake, south Millwood Station, Bronx Parkway extension. Contr. 203. J. Downer, ch. engr.; adv. E. N.-R. Dec. 26.

Oklahoma—Jan. 7, by L. Richardson, clk. Alfalfa Co., 18 span 350 ft. timber trestle bridge at Jet, $25,000; 14 span 300 ft. pile trestle bridge at Ingersoll, $25,000. C. H. Guernsey, Cherokee, engr.

Oklahoma and Texas—Jan. 20, by State Hy. Departments of Oklahoma, at Oklahoma City, and Texas, at Austin, 2 bridges over Red River, one between Marietta, Okla., and Gainesville, Tex., other between Terrell, Okla., and Ringgold, Tex.; adv. E. N.-R. Dec. 26.

Oregon—Jan. 16, by State Hy. Comn., at Multnomah Co. Court House, Portland, concrete bridge over Rogue River between Gold Beach and Wedderburn, Multnomah Co. C. B. McCullough, bridge engr.; adv. E. N.-R. Dec. 26. Noted Dec. 5 under "Gold Beach."

Pa., Phila.—Dec. 27, by Dpt. P. Wks., Bureau of Engineering & Surveys, A. Murdock, dir., City Hall Annex, stone faced concrete arch bridge over Wissahickon Creek, Henry Ave. $1,700,000. Modjeski & Chase, 1420 Walnut St., engrs. Noted Nov. 3, 1927.

Pa., Pittsburgh—Dec. 30, by City Controller, City-County Bldg., repairing Shadeland Avenue Bridge, $30,000. C. M. Reppert, City-County Bldg., engr. Noted Dec. 19.

Wisconsin — Jan. 3, by State and Barron, Bayfield Counties Hy. Comns., Telegram Bldg., Superior, Chetek and Lake Namekagon Bridges, County Trunk D, County Aid Project 8404. W. C. Buetow, state hy. engr.

CONTRACTS AWARDED

New Mexico—See "Streets and Roads."

O., Cleveland—Cleveland, Cincinnati, Chicago & St. Louis Ry. Co., H. Baldwin, ch. engr., Cincinnati, substructure for rein.-con., steel bridge, West 73rd St, and Denison Ave., to Cleveland General Constr. Co., Western Reserve Bldg. Total est. $200,000.

O., Youngstown—City, bridge on Holmes St., to John F. Casey Co., Aspinwall St., Pittsburgh, Pa., $124,579; steel, to McClintic-Marshall Co., Oliver Bldg., Pittsburgh, Pa. Total est. $200,000.

Oklahoma — State Hy. Dpt., Oklahoma City, 1,342 ft. steel truss, girder span bridge over Red River, at Durant, Bryan Co., to Southwest, L. E. Myers Co., Allen Bldg., Dallas, Tex., $230,294. Noted Nov. 14.

South Carolina—State Hy. Dpt., Columbia, substructure for rein.-con. bridge, Saluda Co., to C. Y. Thomason, Greenwood, $37,165—steel superstructure for same, to Greenville Steel & Fdry. Co., Greenville, $18,540—rein.-con., steel overhead bridge, Union Co., to P. Gilmore, Spartanburg, $5,349. Grand total $61,054. Noted Dec. 12.

Va., Norfolk—Office, W. H. Taylor, 3rd, dir. P. Wks., concrete bridge across Lafayette River, on Granby St., to Atlantic Bridge Co., Greensboro, N. C. Noted Nov. 7.

STREETS AND ROADS

BIDS ASKED

Calif., Newport Beach—Jan. 6, by City Council, grading, warrenite bitulithic paving, sanitary sewers, ornamental street lighting streets in Lido Isle. Noted Nov. 14.

Iowa — Jan. 7, by State Hy. Comn., Ames, paving 4 mi. Rd. 55, F-148 and P-586, Clayton and Dubuque Counties—16.442 mi. Rd. 18, P-639—7.095 mi. Rd. 18, P-172—8.815 mi. F-164, all foregoing Fayette Co.—10 mi. Rd. 32, F-145, Guthrie Co.—8.317 mi. Rd. 149, P-130—13.313 mi. Rd. 32, both Iowa Co.—2.7 mi. Rd. 32, F-261, Poweshiek Co. R. F. White, hy. comr.

Kan., Paola—Jan. 8, by Miami Co., grading 7.921 mi. Ottawa-Paola Rd., 28 ft., incl. 49,920 lb. reinforcing; 5.248 mi. Stanton-Plum Creek Rd., 28 ft., 19,670 lb. reinforcing. Francis Pool Co., Court House, engr.

Md., Baltimore—Jan. 2, by Bd. Awards, sheet asphalt paving 12,500 sq.yd. Contr. 541. N. L. Smith, hys. engr.

Michigan—Jan. 7, by H. C. Fleming, resident engr., Grand Rapids, concrete paving 1.227 mi. MO64-12, C-1, 20 ft., Oceana Co., for State Hy. Dpt., Lansing.

Michigan—Jan. 8, at Village Clerk's Office, Hart, concrete paving 1.274 mi. MO64-2, C-2, 20 ft., Oceana Co., for State Hy. Dpt., Lansing. H. C. Fleming, Grand Rapids, engr.

Michigan—Jan. 9, by R. A. Beers, resident engr., Kalamazoo, concrete paving 4.221 mi. MO-39-24, C-1, and MO-13-23, C-1, Kalamazoo and Calhoun Counties, 20 ft., for State Hy. Dpt., Lansing.

N. Y., New York—Jan. 3, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, curbing, sidewalks on Grand View Pl., Longfellow and Allerton Aves., East 229th, East 235th Sts.

CONTRACTS AWARDED

Calif., Oakland—Supervs. Alameda Co., grading, concrete and asphalt surfacing Centerville Rd., to Hutchinson Co., 1450 Harrison St., San Francisco, $25,381. Noted Nov. 28.

Connecticut — State Hy. Comn., Hartford, rein.-con. paving 1,363 ft. hy., Bethel, to Osborne Barnes Co., 20 West St., Danbury—waterbound macadam paving 4,734 ft. Fairfield, to Bridgeport Constr. Co., Milne St., Bridgeport—improving 21,389 ft. Wallingford and Meriden, to L. Suzio Constr. Co., State and Brooks Sts., Meriden. Total est. $200,000.

Iowa—State Hy. Comn., Ames, to C. F. Lytle Constr. Co., 504 Nebraska St., Sioux City, paving 3.991 mi. roads in Adair Co., $41,811; 14.572 mi. Cass Co. $158,336; 10.032 mi. Montgomery Co. $177,824; 25.267 mi. Tama Co. $617,992—to Central Eng. Co., 809 Putnam Bldg., Davenport, 11.77 mi. Keokuk Co., $278,813. Grand total $1,274,776.

Louisiana—State Hy. Comn., Baton Rouge, concrete paving 9.8 mi. Bienville Parish, to Ziegler Bros., Greensboro, N. C., $251,083—2.2 mi., Therra, Lafayette and St. Martin Parishes, to Couch Constr. Co., Dothen, Ala., $478,964—13.7 mi. Acadia Parish, to Moore Bros., New Orleans, $383,691—17.3 mi. Natchitoches and Red River Parishes, to Madison Constr. Co., Edwardsville, Ill., $427,899—concrete culverts, trestles, Ascension and St. James Parishes, to Young & De Britton, Zacharey, $84,572. Grand total $1,626,209. Noted Sept. 15.

Michigan — State Hy. Dpt., Lansing, paving, repairing grade separation U. S. 16, MO63-18, C-8, Oakland Co., to Maintenance Division, (B. C. Tiney), Lansing, $28,749.

Miss., New Augusta — Perry Co., grading, graveling 6.439 mi. Richton-Beaumont Hy. (Mississippi State Hy. 15), to Richton Investment Co., Richton, $25,156.

New Mexico — State Hy. Comn., Santa Fe, grading, crushed material surfacing 7.9 mi. Curry Co., and loose graveling 14.714 mi. San Miguel Co., to T. J. Tobin, Albuquerque, $64,509 and $34,836 respectively; 53 span 1,325 ft. bridge over Rio Grande River, Bernalillo Co., to Armstrong & Armstrong, Roswell, $95,581. Grand total $194,926. Noted Nov. 28.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Merolli Constr. Co., 167-16 108 Rd., Jamaica, grading 77th St., $7,535; 127th St. $10,143; 107th Ave. $6,572—to Stanhy Constr. Co., Steinway Ave., 82nd St. $10,957—to Aragano Constr. Co., 9448 212th St., Hollis, Inwood St. $498—to Kordes Contg. Co., 59 Washington Ave., Brooklyn, Northern Blvd., $49,745—to Peace Bros., Inc., 57 North Lawrence St., Flushing, Winchester Blvd. $10,224; 108th St. $8,672—to Uvalde Asphalt Paving Co., Metropolitan Ave., Brooklyn, asphalt paving Greenpoint Ave. $7,783—to Highway Impvt. & Repair Co., Furmans Island, Brooklyn, Flushing Ave., $54,435—to W. P. McDonald Constr. Co., 7 Lawrence St., Flushing, Farmers Ave. $49,585—to Meehan Paving & Constr. Co., 90 West St., New York, Springfield Blvd., $21,990. Grand total $238,139. Noted Nov. 28.

N. Y., New York—J. Miller, pres. Manhattan Boro, Municipal Bldg., granite block paving East 47th St. and asphalt paving West 46th St., to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., $19,008 and $10,065 respectively. Noted Dec. 5.

N. Y., Yorktown — Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, grading, drainage Bronx Parkway extension from Croton Lake to Crompound Rd., to A. Cianciulli, 923 Nepperhan Ave. Noted Nov. 21.

Ohio—R. N. Waid, dir. Hys., Columbus, 4 in. brick, incl. brick paving 7.842 mi. Cuyahoga Co., to Highway Constr. Co., Guarantee Title Bldg., Cleveland. $1,025,988. Noted Dec. 5.

O., Cleveland—Cuyahoga Co., vitr. brick paving 30,300 sq.yd. Schaaf Rd. 2, to F. W. Stollfuss, Western Reserve Bldg., $153,253. Est. $196,300. Noted Dec. 19.

O., Columbus—W. H. Duffy, dir. Service, to Cleveland Trinidad Paving Co., Grand Theater Bldg., trinidad asphalt paving Stauring St. and 3 avenues, $45,975—to Franklin Asphalt Paving Co., 209 South High St., Grandview Ave., $15,248—to Fritz-Pyle Constr. Co., 1400 North Cleveland Ave., trinidad and mexican asphalt paving Kensington St., 7th and Union Aves., $45,300—to B. F. Patterson, 999 West Goodale St., mexican asphalt paving Broadview Ave., $19,854. Grand total $126,377.

Oklahoma—State Hy. Dpt., Oklahoma City, grading 5.364 mi. S.A.P. 446-B and 5.535 mi. S.A.P. 446-A, Pontotoc Co., to Montgomery & Shoemaker, Ardmore, $22,129 and $21,835 respectively—6.052 mi. S.A.P. 599-C, and 6.126 mi. S.A.P. 599-D, Caddo Co., to Green Constr. Co., 5194 West Main St., Oklahoma City, $52,745 and $51,120 respectively—0.535 mi. La Flore Co., and 4.464 mi. Pushmataka Co., to J. T. Cole, Talahina, $2,470 and $34,120 respectively—6 mi. Washita Co., to D. Sweeney, 615 West 21st St., Oklahoma City, $27,258—0.737 mi. Wagoner Co., to J. H. Maxwell, 2 North Boston St., Tulsa, $27,659—3.855 mi. Muskogee Co., to Garrett Constr. Co., Muskogee, $14,473—6.052 mi. Muskogee Co., to Ellis & Lewis, Surety Bldg., Muskogee, $16,741—1.652 mi. Washita Co., to D. Blackburn, Healdton, $19,562. Grand total $290,112. Noted Dec. 12.

Pennsylvania—State Hy. Comn., Harrisburg, bituminous-treated macadam paving 22,570 sq. yd. York Co., to York Eng. & Constr. Co., York, $60,245—concrete paving 40,200 sq.yd. Route 66, Clarion Co., to H. N. McNutt, Clarion, $241,181—51,642 sq.yd. Route 218, Clarion Co., to State Constr. Co., New Kensington, $245,948—87,400 sq.yd. Berks Co., to E. Riley Mixner Co. & Persaggi Bros., Ocean City, N. J., $414,044—52,400 sq.yd. Fayette Co., to A. G. Rothy, Elizabeth, $358,292. Grand total $1,319,710. Noted Nov. 7.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Missouri and Arkansas—See "Railways."

Tex., San Antonio—City, c/o C. M. Chambers, mayor, cutting 120 ft. new channel, 60 ft. wide between 5th and 7th Sts. $200,000. W. Simpson, c/o Natl. Bank of Commerce Bldg., consult. engr. I. Ewig, city engr. A. Marbach, c/o City Hall, sewer engr. Swiss Plaza Co., c/o H. A. Robards, Real Estate Bldg., financing project. Noted Nov. 14.

BIDS ASKED

Minn., Mankato—Jan. 10, by C. L. Kennedy, aud. Blue Earth Co., County Ditch 76, incl. laying 15,750 ft. 8- to 18-in. tile, average depth 5.53 ft. A. Kircher, Court House, engr.

CONTRACTS AWARDED

California—Pacific Gas & Electric Co., 445 Sutter St., San Francisco, benching for 10 mi. flume on Salt Springs Project, on dividing line of Calaveras and Amador Counties, 40 mi. east of Jackson, incl. 300,000 cu.yd. excav., to Bechtel & Palmer, 206 Sansome St., San Francisco.

Public Bond Elections

Coming Bond Elections

Waterworks—Randolph, Ia., Jan. 7, $21,000.
Waterworks—Frederick, Okla., Dec. 31, $15,000.
Sewers—Frederick, Okla., Dec. 31, $25,000.
Irrigation—Texas, Hidalgo Co. Water Impvt. Dist. 5, c/o H. V. Watts, Donna, Dec. 28, $90,000.
Widening, Deepening, etc., Creeks — Birmingham, Ala., about Feb. 15, $3,000,000.
Viaducts — Johnson City, Tenn., Mar. 6, $200,000.

Bonds Voted

Waterworks—Wakeeny, Kan., $38,000. E. T. Archer Co., Kansas City, Mo., Engr.
Waterworks—Thermopolis, Wyo., $35,000.
Sewers — Vancouver, B. C., $750,000. C. Brackenridge, City Hall, Engr.
Bridges—Vancouver, B. C., $3,500,000. J. R. Grant, 500 Beatty St., Engr.

Bonds Defeated

Sewers—Ft. Smith, Ark., $54,000.
Bridge Repairs, Drainage Structures, etc.—Bee County, Tex., $160,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Mich., Detroit — FEDERAL BUILDING — Treas. Dpt., at office Supervising Archt., Wash., D. C., plans by Smith, Hinchman & Grylls, 800 Marquette Bldg., 10 or 20 story federal building, Fort and Shelby Sts.

N. Y., Brooklyn—PAINT PLANT—Corporation, c/o H. Holder, archt., 242 Franklin Ave., sketches paint manufacturing plant. $800,000.

N. C., Greensboro — POST OFFICE — Treas. Dpt., at office Supervising Archt., Wash., D. C., post office, Market St.

Tex., Galveston—HOSPITAL—Treas Dpt., at office Supervising Archt., Wash., D. C., bids in spring marine hospital. Noted Nov. 22, 1928.

BIDS ASKED

Conn., Hartford—HOSPITAL—Jan. 30, by U. S. Veteran's Bureau, Arlington Bldg., Wash., D. C., buildings and utilities at U. S. Veterans' Hospital.

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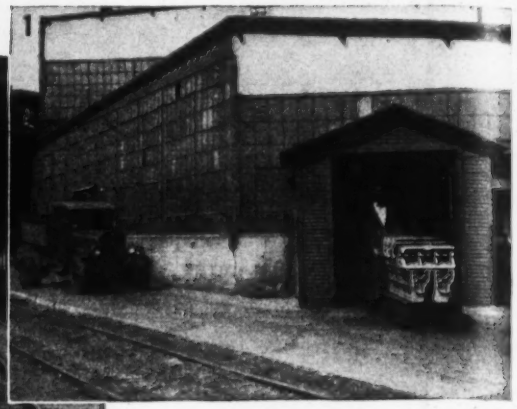

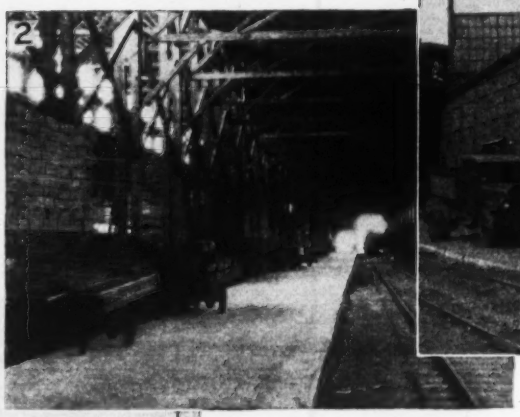

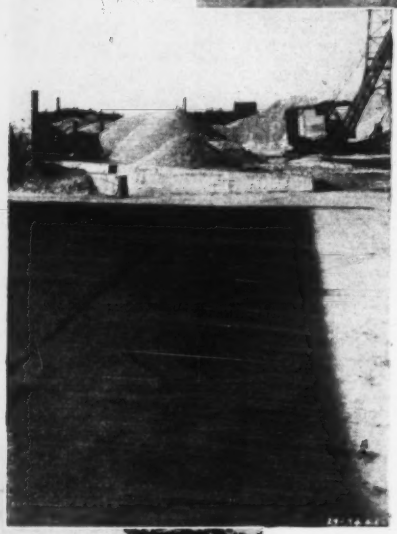

Some Good Reasons

for using High-Early-Strength Universal Concrete on the next driveway you pave

1 **Forty-eight hours after the concrete was placed, trucks hauling heavy loads of castings used a section of driveway** at the plant of the Campbell-Wyant & Cannon Foundry Co., Muskegon, Mich. To insure a high permanent strength, the concrete was kept wet for an additional 2 days. For this work, Fred Wagner, plant engineer, and Peter Ramberg, construction superintendent, used *High-Early-Strength Universal* Concrete.

2 **Three days after the concrete was placed, steel-tired lumber trucks used a 600-foot unloading dock** at the St. Paul yard of the Weyerhaeuser Timber Co. *High-Early-Strength Universal* Concrete was used in paving the dock by Peppard & Fulton, Minneapolis, contractors.

3 **A driveway placed on Saturday was ready for use by heavy trucks the following Monday** at one of the Chicago yards of the Material Service Corporation. To obtain these results, J. J. Marshall, Summit, Ill., in charge of the construction, used *High-Early-Strength Universal* Concrete.

4 **Compressive strength tests averaged 2485 lb. per sq. inch in 3 days and 4225 lb. per sq. inch in 7 days** on driveways at a Batavia, N. Y., service station of the Standard Oil Co. (Concrete as commonly mixed and placed reaches a strength of 2000 lb. in from 21 to 28 days.) Ray F. Otis, engineer, and James A. Crelley, contractor, both of Batavia, used *High-Early-Strength Universal* Concrete for the construction.

[Description of methods for obtaining high-early-strength concrete with the same Universal cement used for regular concrete work will be sent on request. Just use the coupon.]

*Name*_____

*Address*_____

*City*_____ *State*_____

Universal Portland Cement Co.
208 South La Salle Street, Chicago

Without obligation, please send me description of methods for securing high-early-strength concrete with the same Universal cement and other materials used for ordinary concrete.

E.N.R. 12-26-29

Universal Portland Cement Co.
Subsidiary of United States Steel Corporation
Chicago Pittsburgh Minneapolis Duluth Cleveland Columbus New York
Concrete for Permanence

Federal Government (Continued)

Del., Wilmington—DERRICK BOAT—Jan. 17, by U. S. Engineer Office, constructing afloat one 15 ton derrick boat; adv. E. N.-R. Dec. 26.

D. C., Wash.—ROAD—Jan. 23, at office Chief Bureau P. Rds., 513-15 14th St. N.W., grading 12.5 mi. Mount Vernon Memorial from Columbia Island in Potomac River just south of Arlington Memorial Bridge Plaza to Mount Vernon; adv. E. N.-R. Dec. 19 and 26.

Ind., Rushville—POST OFFICE—Jan. 22, by Treas. Dpt., at office Supervising Archt., Wash., D. C., 1 story, basement post office; adv. E. N.-R. Dec. 26.

New York—DREDGING—Jan. 23, by U. S. Engineer Office, Army Bldg., 39 Whitehall St., 49,700 cu.yd. East Chester Creek; adv. E. N.-R. Dec. 26.

Va., Arlington—QUARTERS—Spec. 5973—Jan. 2, by Bureau Yards & Docks, Navy Dpt., Wash., D. C., 2 story, brick quarters. Noted Dec. 12.

CONTRACTS AWARDED

Arizona—ROAD—Natl. Park Comn., C. H. Sweetser, engr., 807 Sheldon Bldg., San Francisco, Calif., surfacing 25.85 mi. road from Bright Angel Springs to Point Cape Royal, Grand Canyon Natl. Park, to Lord & Bishop, Oroville, Calif. Noted Nov. 28.

Mass., Plum Island (mail Newburyport)—DWELLING—U. S. Coast Guard, Wash., D. C., dwelling, incl. sewage disposal, septic tank, at U. S. Coast Guard Station, mouth Merrimac River, to A. E. Steinert, Bay State Bldg., Lawrence. Noted Nov. 14 and 21.

Missouri — DIKES — U. S. Engineer Office, Postal Telegraph Bldg., Kansas City, 6,400 lin.ft. dikes at South Point Beach, to Massman Constr. Co., Kansas City, $191,271. Noted Oct. 17.

Mo., Boles—DIKES—U. S. Engineer Office, Postal Telegraph Bldg., Kansas City, 13,000 lin.ft. dikes in Hinkles and Augusta Bends to Massman Constr. Co., 517 Amer. Bank Bldg., Kansas City, $401,988. Noted Oct. 17.

Mo., St. Albans—DIKES—U. S. Engineer Office, Postal Telegraph Bldg., Kansas City, 5,600 lin.ft. dikes in St. Albans Bend, to List & Weatherby, 413 Railway Exch. Bldg., Kansas City, $179,324. Noted Oct. 17.

N. Y., Watertown — ELEVATORS — Treas. Dpt., at office Supervising Archt., Wash., D. C., in U. S. Post Office, to Otis Elevator Co., 810 18th St. N. W., Wash., D. C., $5,978.

N. D., Fargo—ELEVATORS—Treas. Dpt., at office Supervising Archt., Wash., D. C., installing elevators, to Otis Elevator Co., 810 18th St. N. W., Wash., D. C., $14,014.

Pa., Phila. — ELEVATOR — Treas. Dpt., at office Supervising Archt., Wash., D. C., installing elevator, to Atlantic Elevator Co., Liberty Trust Bldg., $4,670.

Utah—DAM—Dpt. Interior, U. S. Bureau P. Rds., Coalville, Weber-Provo Diversion Canal, Salt Lake Basin Project, to S. H. Newell & Co., 1245 Reed College Pl., Portland, Ore., $141,214. Noted Sept. 12.

Wash., Yakima—STEEL PIPE—U. S. Bureau Reclamation, steel pipe for river crossing, on Mabton Siphon, near here to, Johnson & Gardner, Yakima, and to Pearson Constr. & Eng. Co., Seattle. Est. $52,000.

RAILWAYS

PROPOSED WORK

California—Southern Pacific R.R. Co., G. W. Boschke, ch. engr., 65 Market St., San Francisco, converting 650 box cars into cars of other type $760,000, 175 new flat cars $327,225, 0 new locomotives, $504,930, new equipment and improvements to shops $265,200, all in Sacramento.

Iowa—Chicago & Northwestern R.R. Co., 40 West Madison St., Chicago, Ill., W. J. Towne, ch. engr., and Chicago, Milwaukee, St. Paul & Pacific R.R. Co., Union Station, Chicago, Ill., C. F. Loweth, ch. engr., re-arranging tracks, building additional train sheds to make station now used by above owners as one, at Sioux City, $500,000.

Michigan — Pere Marquette Ry. Co., Union Sta., Detroit, H. A. Cassil, ch. engr., harbor improvements, incl. additional car ferry slips, concrete dock, dock buildings, Ludington, $400,000, Private plans.

Missouri—Ann Arbor Ry. (subsidiary Wabash Ry., J. E. Taussig, pres., St. Louis), expending $1,210,000 during 1930, incl. roadway and structures, $1,115,000; equipment, $95,000.

Missouri—Wabash Ry. Co., M. F. Longwill, ch. engr., St. Louis, expending $12,831,000 for improvements, during 1930, incl. roadway and structures $6,931,000; equipment, incl. 50 locomotives, 2,300 gross tons steel rails, $5,000,000.

Missouri and Arkansas—St. Louis Southwestern (Cotton Belt) Ry., W. S. Hanley, ch. engr., Tyler, Tex., purchasing, improving, extending 5 small railroads in southeast Missouri and northeast Arkansas, $2,336,000; new track, extensions, $342,823; 10 oil-burning locomotives, enlarging shops and round house facilities, $1,113,320; bridge, structure and station additions, betterments, $283,198; river protection work, assessments for public improvements, $191,200; shop and engine house facility additions, betterments, $146,545; rolling stock additions, $521,711.

Ohio — Norfolk & Western Ry. Co., W. P. Wiltsee, ch. engr., Roanoke, Va., expending $1,600,000, new depot, office building and grade elimination work at Portsmouth.

Pennsylvania—Philadelphia & Reading R.R. Co., C. Dillenbeck, ch. engr., Reading Terminal, Phila., eliminating grade crossings, 21st, 32nd and Allegheny Sts., Phila., $3,000,000; and at Chester; rebuilding piers, Port Richmond, Phila., $1,000,000; freight facilities, Front and Noble Sts., Phila., $1,000,000; storehouse, Reading, $80,000; bridges over Susquehanna River at Muncy and Rupert.

Ontario—Hamilton Street Ry. Co., Terminal Bldg., Hamilton, relaying rails on James St. in Hamilton, next year, $75,000.

BIDS ASKED

Pennsylvania—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad Street Station, Phila., taking bids yards, tracks, sidings, in Midland. $200,000.

CONTRACTS AWARDED

Massachusetts — Boston Terminal Co., 236 South Sta., Boston, 4 story, brick, granite railroad terminal, Dewey Sq., Summer St. and Atlantic Ave., Boston, to Sawyer Constr. Co., Park Sq. Bldg., Boston. Est. $500,000. Noted Dec. 19.

New York—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, rearranging railroad tracks, in New York, to Arthur McMullen Co., 50 Church St. Est. $500,000.

GRADE CROSSINGS

PROPOSED WORK

California—State Hy. Comn., Sacramento, and Southern Pacific R.R., G. W. Boschke, ch. engr., San Francisco, surveys crossing on Bay Shore Hy. over Southern Pacific R.R., San Mateo Co. $75,000-$115,000. C. H. Purcell, P. Wks. Bldg., Sacramento, engr.

Calif., Inglewood—Los Angeles Co. (Los Angeles) steel plate girder type grade separation structure, one 78 ft. span, 40 ft. roadway, two 6½ ft. walks, under Santa Fe R.R. near here, $90,000. W. D. Armstrong, Hall of Records, ch. bridge engr.

Colo., Pueblo—State Hy. Dpt., c/o L. D. Blauvelt, engr., Denver, bids early in 1930, double underpass on Kansas-Colorado Blvd., under Missouri Pacific and Santa Fe tracks, 5 mi. east of here. $57,000.

Ill., Chicago—See "Bridges."

New York—Public Serv. Comn., Albany, eliminating 133 grade crossings for 1930 program, $12,000,000.

N. Y., Canton—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating Canton-Potsdam State Hy., 2 mi. north of here. $90,000.

N. Y., Erwins (mail Painted Post) — Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, eliminating Kelly or Gee Grade Crossing, west of Erwins Station. $163,000.

N. Y., Mapel View—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating Mexico-Union Square State Hy. Grade Crossing. $103,200.

N. Y., Mumford—Buffalo, Rochester & Pittsburgh R.R. E. F. Robinson, ch. engr., Rochester, eliminating North Street Crossing. $119,000.

N. Y., Redwood — New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York eliminating Main and Pine St. Crossing. $139,300.

Pennsylvania—See "Railways."

Pa., Etna (br. Pittsburgh) — Allegheny Co. (Pittsburgh), eliminating grade crossing, near here. $800,000. Cost to be borne by county, state and Baltimore & Ohio R.R. Co. N. F. Brown, consr. Dpt. P. Wks., 519 Smithfield St., Pittsburgh, engr.

Texas—State Hy. Dpt., Austin, concrete, steel overpass over railroad tracks on State Hy. 16, Federal Aid Project 434-B, Wilson Co. $45,600. E. L. Marek, Poth, resident engr.

BIDS ASKED

N. Y., Brooklyn—Jan. 17, by Bd. Transportation, J. H. Delaney, chn., 49 Lafayette St., New York, constructing Linden Blvd. undercrossing at Livonia Avenue Yard.

Pa., Phila.—Dec. 27, by Dpt. P. Wks., Bureau Engineering & Surveys, A. Murdock, dir., City Hall Annex, grade crossings, Manayunk elevated, grading, paving, sewers, Contr. 103. $150,000.

Tex., Dallas—Jan. 3, by City c/o E. Goforth, secy., and Texas & Pacific R.R., E. F. Mitchell, ch. engr., T. & P. Bldg., rein.-con., steel underpass, Good St., from Elm St. to Swiss Ave. $225,000.

CONTRACTS AWARDED

N. Y., Phelps—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., eliminating Phelps-Clifton Springs County Hy. Crossing, to Arthur McMullen Co., 50 Church St., New York, $66,363—reinforcing steel, to American Steel Co., Cannonsburg, Pa., at $2.51 per bbl.

GRAIN ELEVATORS

CONTRACTS AWARDED

Minn., Minneapolis—Great Northern Ry. Co., J. R. W. Davis, ch. engr., St. Paul, general contract 3,000,000 bu. grain elevator addition, to Peppard & Fulton, 1004 Roanoke Bldg. Est. $600,000. Driving piles and working on footings.

POWER AND LIGHTING

PROPOSED WORK

Calif., Oakland—Ornamental lighting system with underground work in San Pablo Ave. between Emeryville city limits and south city limits of Berkeley. To exceed $25,000. G. N. Randle, city engr.

BIDS ASKED

Ill., Chicago — Dec. 28, by M. J. Kennedy, comr. Gas & Electricity, City Hall, furnishing, installing gas and electric street lighting equipment.

New York—Jan. 7, by Westchester Co. Park Comn., 72 West Porvlfield Rd., Bronxville, electric lighting on Cross Country Rd. and on Bronx River Parkway, in vicinity Fenimore Rd., in Rye and Scarsdale, Contr. 285. J. Downer, Bronxville, ch. engr.; adv. E. N.-R. Dec. 26.

N. Y., New York—Jan. 14, by Bd. Transportation, J. H. Delaney, chn., 49 Lafayette St., installing power equipment for portion Independent System of City Subways.

N. Y., New York—Jan. 16, by Superintendent P. Wks., 353 Bway., Albany, electrical work for State Office Building.

SPORTS AND PARKS

PROPOSED WORK

Okla., Stillwater—Oklahoma Agriculture & Mechanical College, H. G. Burnett, pres., preliminary plans athletic stadium, $150,000. Private plans.

BIDS ASKED

Mass., Marshfield—See "Contracts Awarded."

Wis., Milwaukee—Dec. 30, by Dpt. P. Wks., D. McKeith, comr., filtering, recirculating chlorinating systems for natatorium, Greenbush and Jackson Sts.

CONTRACTS AWARDED

Mass., Marshfield—Marshfield Country Club, golf course addition, day labor under supervision of Stiles & Van Kleek, 97-A Newbury St., Boston. Est. $25,000 or more.

HEATING AND VENTILATING

BIDS ASKED

N. Y., Brooklyn—Jan. 6, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., heating, ventilating, plumbing, drainage, electrical work and lighting fixtures, for P. S. 224, Wortman Ave.; P. S. 238, East 8th St.; electric freight elevator, electric platform hoist in Brooklyn Trade School, Dean St., for Bd. Educ., 500 Park Ave., New York.

N. Y., Edgemere—Jan. 6, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, heating, ventilating, plumbing, drainage, electrical work, for P. S. 106, Edgemere Ave., for Bd. Educ., 500 Park Ave., New York.

UNCLASSIFIED

PROPOSED WORK

N. Y., New York—COMFORT STATION—Bronx Zoological Society and Dpt. Parks, W. J. Herrick, pres. Park Bd., Arsenal Bldg., Central Park, bids early in January, comfort station, Bronx Zoo. $40,000. Stoughton & Stoughton, 96 5th Ave., archts. Noted Dec. 12.

Pa., Phila. — FREIGHT FACILITIES — See "Railways under Pennsylvania."

Ont., Port Stanley — PIER — See "Warehouses."

Prince Edward Island—SHIP—Prince Edward Island Car Ferry plans by Lambert & German, Montreal, new ship to be placed on ferry service. $2,000,000.

BIDS ASKED

N. J., Secaucus—ELEVATORS, etc.—Dec. 26, by Bd. Freeholders Hudson Co., Court House, Jersey City, elevators, dumbwaiters in Contagious Diseases Hospital, at Laurel Hill. F. J. Radigan, Jersey City, co. engr.

N. Y., New Paltz—FOUNDATION—Dec. 27 (extended date), by Commissioner Education, Educ. Bldg., Albany, foundation for Practice School, State Normal School. Noted Nov. 21.

N. Y., New York—SCOWS—Dec. 30, by M. Cosgrove, comr. Docks, Pier "A," Battery Pl., 2 new deck scows, Contr. 1971.

N. Y., New York—ELEVATORS—Jan. 6, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract passenger elevators and electric platform hoist in Textile High School, West 18th and 19th Sts., east of 9th Ave., for Bd. Educ., 500 Park Ave.

N. Y., Plattsburg—FOUNDATIONS—Dec. 27 (extended date), by Commissioner Dpt. Education, Educ. Bldg., Albany, foundation, for Plattsburg Normal School. Noted Nov. 21.

N. Y., Poughkeepsie — REFRIGERATION WORK — Jan. 15, by Commissioner Dpt. Mental Hygiene, Capitol, Albany, refrigeration work for infirmary, Hudson River State Hospital.

O., Cleveland — ELEVATORS — Jan. 14, by Jail and Court House Building Comn., Court House, elevators for new jail and courts building. $100,000. Warner & Mitchell, Bulkley Bldg., engrs.

Wis., Milwaukee—PLUMBING, etc.—Jan. 3, by Bd. School Directors, F. M. Harbach, secy., plumbing, heating, ventilation, heat regulators, electrical and lighting fixtures in Cass Street School, G. E. Wiley, c/o owner, archt. Noted Nov. 21 under "Schools."

CONTRACTS AWARDED

Calif., Oakland—TRANSIT SHED—City Port Comn., Transit Shed 2, to R. W. Littlefield, 337 17th St., $108,115.

Mich., Muskegon — DOCKS, CAR FERRY SLIPS—Grand Trunk Ry. Co., Detroit, dredged slip with concrete, timber structures, and con-

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Wooden Structural Materials Creosoted By

REPUBLIC

Controls entire Treating Process from the forest to your plant

Timbers are seasoned and framed in Republic's six great plants—properly impregnated—with REAL creosote oil, also manufactured by Republic.

WOOD BLOCK FACTORY FLOORING
LUMBER and TIMBER
POLES and PILING
RAILROAD TIES
and
CREOSOTE OIL

REPUBLIC CREOSOTING CO.

Home Office and Plant: Indianapolis

OTHER PLANTS

St. Louis Park, Minn. Norfolk, Va.
Seattle, Wash. Salt Lake City, Utah
Mobile, Ala.

View from our Indianapolis plant showing structural timbers in the foreground. This plant covers 80 acres and carries heavy stocks of treated and untreated timbers at all times.

Unclassified (Continued)

crete docks, timber decks on concrete walls and timber piling, to E. E. Gillen Co., 288 East Water St., Milwaukee, Wis.

MATERIALS

BIDS ASKED

GASOLINE—**Jacksonville, Fla.**—Dec. 30, by City Comn., 25,000 gal. gasoline, 8,000 lb. 8 to four naught copper wire, $5,000.

PERIWINKLE SHELL—**Jacksonville, Fla.**—Jan. 2, by Comrs. Duval Co., c/o F. Brown, clk., 10,000 sq.yd. Periwinkle shell at various unloading points.

MANHOLE FRAMES, etc.—**Newark, N. J.**—Dec. 30, by Bd. City Comrs., City Hall, manhole frames, covers, c.i. air vents, gate valves, air valves, pressure regulating valves, brass pipe, $25,000. J. Costello, city engr.

CAR AXLES, etc.—**Pittsburgh, Pa.**—Dec. 27, by J. H. James, purch. agt. Pittsburgh & Lake Erie R.R. Co., Pittsburgh & Lake Erie Terminal Bldg., 30 net tons car axles in accordance with N.Y.C. Spec. 1004-A, 25 net tons car axles Spec. 1001-B, 1,000 bbl. cement in cloth to meet specifications American Society for Testing Materials, 6,600 pieces seamless steel tubes in accordance with N.Y.C. Spec. 1009-A, to be covered by Serial Contr. 1, Series 1930.

EQUIPMENT

PROPOSED WORK

TRACTOR—**Clinton, Ia.**—Clinton Co. purchasing 60 to 75-hp. track-type road tractor. E. Lorenzon, Court House, engr.

BIDS ASKED

ROAD MAINTAINERS—**Victoria, Tex.**—Jan. 13, by Victoria Co., c/o J. J. Woodhouse, judge, 2 road maintainers.

PUMP — **Lachine, Que.** — Dec. 31, by H. Daoust, secy.-treas., diesel oil engine driven pump.

FOREIGN

Mexico — E. J. O'Hara, Harlington, Tex., race track, equipment and amusement building, at Rio Rico, Tamaulipas. Merrell Edwards, and T. Carey, c/o owner, engrs.

New Zealand, Wellington—Jan. 27, by Secretary, Post and Telegraph Dpt., transmitters, breastplate, without cord or plug, B.P.O. Type—or equivalent substitutes; Feb. 3, for 3,000 pairs blocks for use in B.P.O. type protectors; Feb. 5, for 500 fuses, indicator, alarm 1-2 amperes, 1,000 fuses indicator alarm, 2-85 amperes; and Feb. 13, 2,500 campapal caps, B.P.O. type.

New Zealand, Wellington—Feb. 18, Secretary P. Wks., and Tenders Com., galvanized steel screens.

T. H., Honolulu—Langley & Michaels, 50 1st St., San Francisco, Calif., plans by H. H. Meyers, Kohl Bldg., San Francisco, Calif., 3 story, basement, rein.-con., office and salesroom, $150,000.

Buildings

RESIDENTIAL

(Apartments unless otherwise noted)

BIDS ASKED

Md., Baltimore—See "Contracts Awarded."

N. J., East Orange — See "Contracts Awarded."

N. J., Irvington—I. Bornstein, 157 Arlington St., taking bids separate contracts 5 story, basement, 80 x 100 ft., brick, steel, plain found., Union Ave., $150,000. E. F. Hauser, 9 Clinton St., Newark, archt.

N. Y., Brooklyn—Fifty-Sixth Street and 12th Avenue Corp., 1043 85th St., taking bids separate contracts 6 story, 86 x 100 ft., brick, timber, 55th St. and 12th Ave. $250,000.

N. Y., Brooklyn—Hanson-Elliott Place Corp., 65 Court St., taking bids on separate contracts 12 story, brick, steel hotel, Hanson and Elliott Pls. $700,000. M. Klein, 65 Court St., archt.

N. Y., Long Beach—J. Manowitz, postponed taking bids until summer, 6 story, 100 x 150 ft., brick, timber apartment hotel, Bway. and Magnolia Blvd., $400,000. H. Wurwitt, 41 West 33rd St., New York, archt. Noted July 25.

N. Y., Long Island City — See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., New York—One Hundred Seventy-Two West Seventy-Ninth Street, Inc., C. P. McMorrow, pres., 342 Madison Ave., taking bids separate contracts 18 story, 383 Amsterdam Ave., $750,000. G. A. Bagge & Sons, 157 East 44th St., archts. Noted Dec. 12.

CONTRACTS AWARDED

Ill., East St. Louis—W. A. Besecke, archt., 114 West 10th St., Kansas City, Mo., 8 story, basement, rein.-con., brick, steel, stone, terra cotta hotel, garage, market, to Geo. Fuller Green, 116 East 9th St., Kansas City, Mo. $150,000.

Md., Baltimore—Investment Constr. Co., A. Hunt, in charge, 339 St. Paul St., 8 story, basement, 93 x 180 ft., concrete, brick, steel, separate contracts, $1,000,000. L. T. Rouleau, Investment Bldg., Wash., D. C., archts.

N. J., East Orange — Krieger Built, Inc., 91 7th Ave., Newark, 4 story, basement, 94 x 152 ft., brick, steel, plain found., 56 North Arlington Ave., separate contracts, $300,000. Warren & Warren, 31 Clinton St., Newark, archts.

N. Y., Astoria (sta. Long Island City)—Merchants Constr. Corp., 3504 31st Ave., eight 6 story, brick, timber, senarate contracts, $200,000. M. Margolin, 105 Court St., Brooklyn, archt. Noted Sept. 20.

N. Y., Long Island City—Fieldwood Realty Co., Woodside, fourteen 3 story, 20 x 84 ft. brick, timber, Queens Blvd. and 41st St., separate contracts, $210,000. C. Stidolph, Elmhurst, archt.

N. Y., New York—R. Pagano, 77 Stebbins Ave., Tuckahoe, 5 story, 99 x 100 ft. apartments, separate contracts, $150,000. W. Farrell, 4200 Bronx Blvd., archt. Noted Dec. 12.

N. Y., New York — Corporation, c/o L. Cowan, 570 7th Ave., 14 story, steel, brick, to L. Cowan, 570 7th Ave. Est. $550,000. Noted Dec. 12.

CLUBS

PROPOSED WORK

Calif., Sacramento — Knights of Columbus, c/o H. J. Devine, archt., 1405 41st St., 3 story, rein.-con. club, incl. lodge room, auditorium, gymnasium, 18th and J Sts. $160,000.

N. Y., White Plains—B. P. O. E., E. A. O'Brien, secy., Hamilton Ave., new bids in spring 2 story clubhouse, Hamilton Ave. $200,000. Schultz & Whitney, 420 Madison Ave., New York, archts. L. T. M. Ralston, 52 Vanderbilt Ave., New York, mechanical engr. Noted Aug. 9.

BIDS ASKED

N. J., Red Bank—V. J. Eck, archt., 42 Peters Pl., bids about Jan. 15, general contract 2 story, basement, brick, steel, plain found., Broad St., for B. P. O. E., A. K. Giron, chn. Building Comn. $150,000. Noted Nov. 28.

HOSPITALS

PROPOSED WORK

Ill., Chicago—General Foot Hospital Assn., c/o Houlihan, Hauser & Marks, archts., 64 West Randolph St., sketches 9 story, basement, 115 x 169 ft., rein.-con., brick, 730 South Lincoln St. $575,000.

N. J., Newton—Bd. Freeholders Sussex Co., Court House, revised plans by Sutton, Sutton & Calkins, 402 Broad St., Newark, 4 story, basement, brick, steel, plain found. $450,000.

N. Y., Binghamton — Our Lady of Lourdes Memorial, 160 Riverside Dr., hospital, nurses home and power plant. $455,000. Maturity in March or April. Murphy & Lehman, 208 Livingston St., Brooklyn, archts. Noted Aug. 1.

N. Y., Freeport—Freeport Hospital, D. W. Pine, 25 South Main St., 3 story, Prince and Pennsylvania Aves. $500,000. Maturity in spring. Purdy & Davis, 350 Madison Ave., New York, archts. Noted Jan. 26, 1928.

N. Y., New York — **Mount Sinai Hospital**, 100th St. and 5th Ave., plans by Kohn & Butler, 56 West 45th St., 72 x 201 ft., brick, steel, 1 East 100th St. $750,000. Noted Jan. 10.

BIDS ASKED

Ill., Chicago—Jan. 2, by Coolidge & Hogdon, archts., 134 South La Salle St., 5 story, rein.-con., brick, stone, 59th St. and Ellis Ave., for University of Chicago, 122 South Michigan Ave. $600,000.

Mich., Battle Creek—Jan. 10, by Leila Post Montgomery Hospital, 2 and 3 story, basement, 40 x 185 ft., concrete, brick, steel, stone, plain found., Emmet St. $220,000. Schmidt, Gardner Erickson, 104 South Michigan Blvd., Chicago, Ill., archts. Noted Oct. 3.

CONTRACTS AWARDED

Md., Baltimore — Johns Hopkins Hospital, Bway. and Jefferson St., 8 story, concrete, brick, steel, to Consolidated Eng. Co., 20 East Franklin St. $1,000,000. Noted Mar. 14.

CHURCHES

PROPOSED WORK

Md., Baltimore—Grace Methodist Episcopal Church, c/o Frohman, Robb & Little, archts., 16 Jackson Pl., Wash., D. C., Wm. W. Emmart, assoc. archts., Union Trust Bldg., 1 and 2 story, stone church, school and parsonage, Charles St. and Belvedere Ave. $350,000.

N. Y., Woodside—Church, c/o F. G. Baer, pastor, plans by A. F. Meissner, 89-20 162nd St., Jamaica, 52 x 132 ft. church and rectory, Atlantic Ave. and 84th St. $180,000.

BIDS ASKED

N. Y., Astoria (sta. Long Island City) — Church of Precious Blood, 32-23 36th St., bids about Jan. 15, general contract church, Bway., 36th and 37th Sts. $200,000. McGill & Hamlin, 415 Lexington Ave., New York, archts. Noted Oct. 24.

Pa., Phila.—Dec. 27, by Hoffman-Henon Co., archts., Finance Bldg., 3 story, basement, 56 x 146 ft., brick, limestone, steel, incl. Sunday school, plain found., Levick and Hawthorne Sts., for St. Anthony Roman Catholic Church, F. F. Brady, pastor, 3121 Robbins Ave. $200,000.

CONTRACTS AWARDED

N. Y., New York—Roman Catholic Ladies of Charity of New York, 338 Lexington Ave., 6 story institutional, to J. Lowry, 270 Madison Ave. Est. $165,000. Noted Dec. 12.

SCHOOLS

PROPOSED WORK

Calif., Long Beach—Bd. Educ. sketches by Wright & Gentry, Marine Bank Bldg., Junior High School, 2 story, brick, tile, stone, Market and Louis Aves.

Ill., Chicago — University of Chicago, 122 South Michigan Ave., F. C. Woodward, vice pres., sketches International House. $2,000,000 donated by John D. Rockefeller, Jr.

Kan., Topeka—Bd. Educ. soon takes bids 3 story, basement, 300 x 530 ft., rein.-con., brick stone high school, incl. auditorium, library, gymnasium, and 25 x 60 ft. swimming pool, 10th and Taylor Sts. $1,100,000. Noted Feb. 7.

Mass., North Reading — Town, R. L. Estey, chn. building com., soon takes bids altering and constructing 2 story, basement, brick, stone addition, plain found., $150,000 or more. J. E. Allen, 351 Essex St., Lawrence, archt. Noted Aug. 15.

Mass., South Hadley—Mount Holyoke College, M. E. Woolley, pres., sketches by G. F. Newton, 6 Beacon St., Boston, memorial library, Main St., to exceed $150,000; also plans Dwight Art Memorial addition, theatre and physical chemical laboratory, Engineer and architect not selected. A. A. Shurtleff, 11 Beacon St., Boston, landscape archt. on latter project.

N. J., Carlstadt—Bd. Educ., Boro Hall, plans by Hacker & Hacker, 201 Main St., Fort Lee, 2 story, basement, brick, steel, rein.-con., plain found., Washington St. $250,000. Noted Dec. 12.

N. J., Union City — Bd. Educ., City Hall, School 2, 3 story, basement, brick, steel, plain found., Central Ave. and 10th St. $200,000. Engineer and architect not selected.

N. J., Union City — Bd. Educ., City Hall, School 6, 3 story, basement, 3rd and West Sts. $250,000. Engineer and architect not selected.

N. J., Plainfield—St. Mary's Roman Catholic Church, P. A. Maher, pastor, 516 West 6th St., 2 story, basement, brick, steel, plain found., Liberty St. $300,000. Engineer and architect not selected.

N. Y., Scotia — Bd. Educ. plans by J. M. Ryder, Hay St., Schenectady, school, Wren St. $240,000.

Tex., Bay City—Bay City Independent School Dist., c/o R. Baker, secy., plans by H. D. Payne, 714 Kirby Bldg., Houston, and bids about Jan. 1, 1 story high school, campus. $175,000. Noted July 11 under "Buildings—Educational, Religious."

BIDS ASKED

Conn., Hartford — City, 2nd North School Dist., R. L. George, chn., taking bids brick, steel addition, auditorium. $300,000. Former bids rejected. Golden Storrs & Co., 983 Main St., archts. Contractors refiguring.

Ill., Chicago — D. B. Hull & S. W. Hahn, archts., 77 West Washington St. bids Jan. 1 (invitation only), 3 story, basement, 20 x 150 ft., rein.-con., brick, stone, tile, 57th St. and Woodlawn Ave., for Meadville Theological School, 57th St. and Woodlawn Ave. $200,000.

Ill., Chicago—Jan. 7, by Bd. Educ., general contract Bolta Elementary School, North Avers Ave. and Argyle St. and Morgan Park Elementary School, 110th Pl. and Western Ave. $300,000 each.

Ind., Ft. Wayne—Jan. 3, by Catholic Church, 2 story, basement, 98 x 108 ft., rein.-con., brick parochial school, South Fairfield Ave. $150,000. Noted Nov. 28.

Mass., Attleboro—Dec. 27, by Town, L. A. Fales, chn. building com., 2 story, basement, brick, steel, Hebronville Sect. $150,000. E. M. Corbett, Bedford St., Fall River, archt. Noted Dec. 5.

Mass., Stoneham—Town, F. W. Porter, supt. High School, taking bids 2 story, basement, brick, stone school, plain found., Wright St. $150,000. Kilham, Hopkins & Greeley, 9 Park St., Boston, archts. Noted Nov. 21.

N. J., Bayonne—Bd. Educ., City Hall, taking bids 2 story, basement, rein.-con., brick, steel, plain found., Avenue B between 50th and 57th Sts. $600,000. D. G. Anderson, 718 Bway., archt. W. W. Chapin, 110 East 42nd St., New York, engr. Noted Oct. 10.

N. J., Jersey City — Burstyn Heftler Corp., 404 38th St., Union City, bids about Feb. 15, general contract 5 story, basement, 70 x 100 ft., brick, steel, plain found., Academy St. $250,000. C. Shilowitz, 26 Journal Sq., archt. Noted Nov. 7.

N. J., Linden—Bd. Educ., St. George Ave., bids about Jan. 15, general contract 2 story, basement, brick, steel addition to School 4, incl. auditorium, gymnasium, plain found., Cranford Ave. $150,000. H. B. Brady, Inc., 333 North Broad St., Elizabeth, archt.

N. J., Newark—Jan. 8, by Bd. Educ., Green St., general contract altering and constructing 2 story, basement, rein.-con., brick, steel addition to Barringer High School. $350,000. Guilbert & Betelle, 20 Branford Pl., archts. Noted Dec. 19.

N. J., Princeton—Dec. 28, by C. Z. Klauder, archt., 1429 Walnut St., Phila., Pa., 3 story, basement, 83 x 140 ft., brick, steel college, for Princeton University. $300,000. Noted May 2.

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Schools (Continued)

N. Y., New York—Dec. 30, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract P. S. 97, Mace Ave., from Fish to Seymour Aves., for Bd. Educ., 500 Park Ave. Noted Dec. 12.

N. Y., Brooklyn—Dec. 30, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., general contract P. S. 176, 68th St., Bay Ridge and 12th Aves., for Bd. Educ., 500 Park Ave., New York.

N. Y., Schenectady—Jan. 8 (selected list of bidders), by Bd. Contr. & Supply, F. R. Lanagan, city engr., High School, Jay St. $1,200,000. R. Bowen, State St., archt. Noted Nov. 7.

Pa., State College—Jan. 3, by C. Z. Klander, archt., 1420 Walnut St., Phila., School of Home Economics, 3 story, basement, 39 x 81 ft., brick, plain found., for Penn State College. $200,000.

Wis., Milwaukee—Jan. 3, by Bd. Educ., F. M. Harbach, secy., Johnson's Woods School, 3 story, basement, 126 x 132 ft., brick, concrete, Adler St. $350,000. G. E. Wiley, c/o Bd. School Directors, archt.

Ont., London—Bd. Educ., F. Gray, chn., taking bids 2 story, basement, 80 x 175 ft., brick, concrete, Dundas East. $180,000. Noted Oct. 3.

CONTRACTS AWARDED

Calif., Redlands — Marsh, Smith & Powell, archts., Architects Bldg., Los Angeles, Hall of Arts and Letters, 3 story, rein.-con., to Edwards, Wildey & Dixon, Edwards-Wildey Bldg., Los Angeles, $159,165. Noted Nov. 28.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, general contract P. S. 241, to Lynn Eng. Co., 57-16 Woodside Ave., $524,700. Noted Dec. 5.

N. Y., Voorheesville—School Bd., 2 story, 90 x 120 ft., to C. M. McLean & Sons, 332 Water St., Binghamton. Est. $150,000.

Okla., Sand Springs—Bd. Educ., E. Dixon, clk., general contract 2 story, 110 x 145 ft., rein.-con., brick, tile, to Acme Constr. Co., 606½ South Main St., Tulsa. Est. $100,000. Noted Nov. 21.

Okla., Seminole—Bd. Educ., 2 story, basement, rein.-con., brick high school, to R. H. Chase, Seminole, $194,544. Noted Nov. 21.

O., Cincinnati—Bd. Educ., 216 West 9th St., excavation for 2 and 3 story, basement, to Roos-Meyer-Hecht Co., 2824 Stanton Ave.; brick and stone, to David Hummel Co., 2629 Spring Grove Ave.; balance of work, to David Gordon Constr. Co., Burnet and Northern Ave. Est. $1,207,213. Noted Nov. 21.

Tex., Alpine—Sul Ross State Teachers' College, Bd. Regents, c/o H. A. Turner, secy., Austin, 3 story, 60 x 200 ft., with 57 x 105 ft. extension in rear, brick, stone, steel, rein.-con., library, to R. E. McKee, El Paso, $145,000. Noted Nov. 28 under Abilene.

THEATERS

PROPOSED WORK

Mass., Boston—Artkino Guild, C. S. Parker, 12 Huntington Ave., sketches by W. S. Bogner, Little Bldg., 1 story, basement, brick, steel, plain found., 349 Newbury St. $160,000.

BANKS

PROPOSED WORK

N. Y., New York — Centurn Corp., F. J. Fuller, pres., 70 Bway., plans by F. Pelham, 570 7th Ave., 16 story, 49 x 100 ft. bank and office, 6th Ave. and 35th St. $750,000.

N. Y., New York — Chemical Bank & Trust Co., 165 Bway., bank and office, 9th St. and University Pl. To exceed $150,000. Engineer and architect not selected.

BIDS ASKED

N. J., Hackensack—A. E. Dore, archt., 173 Main St., bids about Jan. 15, general contract 2 story, basement, 80 x 130 ft., brick, steel, plain found., Main and Essex Sts., for State Bank & Trust Co., 210 Main St., Hackensack. Est. $150,000. Noted Dec. 19.

CONTRACTS AWARDED

Mass., Quincy — Quincy Trust Co., H. E. Curtis, pres., altering and constructing 1 story, basement, brick, stone, concrete, steel addition, plain found., incl. vault, night safes, Hancock St., to Clark & Smith, 13 Temple St. Est. $150,000.

N. J., Newark — Vailsburg Trust Co., 990 South Orange Ave., general contract 2 story, basement, 200 x 200 ft., brick, steel, plain found., to State Constr. Co., 24 Commerce St. Est. $250,000. Noted Nov. 28.

OFFICES

PROPOSED WORK

N. J., New Brunswick — J. L. Mott, 31 Morgan Ave., Brooklyn, N. Y., plans by G. E. Fulton, Jr., 19 West 44th St., New York, 14 story, basement, rein.-con., brick, steel, plain found., Livingston Ave. $1,000,000. Noted Dec. 12.

N. Y., New York—H. L. Doherty Co., 60 Wall St., sketches by Clinton & Russell, 17 John St., 50 story office building, Wall St.

N. Y., New York—Morris Cassard, Jr., 232 59th St., plans by Stiffens & Gustafson, 8422 106th St., Richmond Hill, 100 x 115 ft., brick, incl. factory, East 43rd St. near 2nd Ave. $245,000.

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N. Y., New York — Two West Fifty-Fifth Street Corp., J. Mayer, pres., 261 West 43rd St., bids in March or April, general and separate contracts 20 story office building, 2 West 55th St. $750,000. Noted Aug. 29.

BIDS ASKED

Md., Baltimore—Jan. 7, by Mottu & White, archts., 527 North Charles St., 8 story, concrete, brick, steel, Saratoga and Charles Sts., for Baltimore Life Insurance Co., 17 West Saratoga St. $700,000. Noted Sept. 19.

N. J., Jersey City—W. Neuman, archt., 26 Journal Sq., bids about Feb. 1, general contract 15 story, basement, brick, steel, rein.-con., incl. stores, plain found., Newark and Oakland Aves., for Spingarn Realty Co., J. Spingarn, pres., 591 Summer Ave. Est. $750,000. Noted Nov. 7.

N. J., Kearany (sta. Arlington)—Jan. 6, by Seaboard By-Products Coke Co., Newark Turnpike, and Hackensack River, 3 story, basement, brick, steel. $150,000. E. P. Mellon, 350 Madison Ave., New York, archt.

N. J., Passaic—M. Steinberg, 277 Monroe St., taking bids general and separate contracts 3 story, basement, brick, steel, plain found., 83 Lexington Ave. $150,000. Private plans.

Ore., Portland — Bennes & Herzog, archts., Chamber of Commerce Bldg., bids about Feb. 10, 100 x 100 ft., rein.-con., incl. stores, plain found., 6th and Salmon Sts., for J. E. and E. O. Blazier, Portland. $2,000,000.

CONTRACTS AWARDED

Que., Montreal—Alfred & Co. Ltd., 127 St. James St., superstructure for 23 story office building, to Foundation Co. of Canada Ltd., 746 Sherbrooke St. W.; completing foundation work, to Anglin-Norcross, 65 Victoria St.; steel, to Dominion Bridge Co., Montreal. Noted June 6.

STORES

PROPOSED WORK

Calif., Los Angeles—G. W. Teague, Cleveland, O., plans by A. H. Stibolt, Western Pacific Bldg., 6 story, basement, 60 x 135 ft., steel, rein.-con., incl. restaurant, banquet rooms, Hill St., $1,000,000.

N. Y., Flushing—M. Abramson, 46 Main St., plans by J. Unger, 93 Main St., 2 story, 70 x 140 ft., brick, Main and Washington Sts. $150,000.

N. Y., New York—F. Ballantine & Sons, 57 Freeman St., Newark, N. J., bids in spring, general and separate contracts 12 story, 78 x 156 ft., brick, steel, 15 Albany St. $850,000. Renwick, Aspinwall & Guard, 8 West 40th St., archts. Noted Dec. 5.

BIDS ASKED

N. J., Camden—S. S. Kresge Co., c/o D. G. Munro, Walt Whitman Hotel, taking bids 2 story, basement, 60 x 200 ft., brick, plain found., 1142 Bway. $200,000. Private plans. Noted Oct. 3.

O., Canton — Dec. 27, by Walker & Weeks, archts., 2341 Carnegie Ave., Cleveland, 3 story, stone, steel, concrete department store, for Halle Bros. Co., S. H. Halle, pres., 911 Cleveland Ave. N. W., $150,000.

Pa., Phila.—Dec. 30, by Silverman & Levy, archts., 13th and Chestnut Sts., 3 story, basement, 44 x 100 ft., rein.-con., brick, steel, 1722 Chestnut St., for Jules & Louis Winkelman, Heymann Bldg. $150,000.

CONTRACTS AWARDED

Tenn., Memphis—John Gerber Co., 25 Main St., rebuilding present store and additions, Main St. frontage 113 ft., to E. J. Pearson, Fidelity Bank Bldg. Est. $300,000.

PUBLIC

PROPOSED WORK

California — LEGION MEMORIAL — Santa Clara Co. (San Jose) to levy a tax to finance buildings in various sections county. $350,000 or more.

Calif., San Francisco—HEALTH CENTER—City and San Francisco Co., plans by S. Heiman, 57 Post St., 4 story, basement, rein.-con., granite, Polk and Grove Sts., $600,000.

Mass., North Brookfield — PRISON — Commonwealth of Massachusetts, Executive Office of State Police, Boston, state prison. To exceed $150,000. Private plans.

N. Y., Greycourt—DORMITORY—Jan. 7, by Dpt. Correction, Municipal Bldg., New York, dormitory and administration building wings, at Women's Farm Colony, Orange Co. Noted Dec. 19.

N. Y., New Hampton—DORMITORY—Jan. 7, by Dpt. Correction, Municipal Bldg., New York, R. C. Patterson, Jr., comr., dormitory, at New York City Reformatory, Orange Co.

N. Y., New York—BATH HOUSE—J. J. Miller, pres. Manhattan Boro, Municipal Bldg., bids after Jan. 2, public bath house, Carmine St. $150,000. M. Bernstein, 137 East 41st St., archt.

R. I., Howard—HOSPITAL—State, P. Welfare Comn., Providence, altering and reconstructing brick, steel criminal insane ward building at state hospital, plain found. $150,000-$160,000. T. J. H. Pierce, City Hall, Providence, engr.

BIDS ASKED

N. J., Paterson—HALL of RECORDS and JAIL—Bd. Freeholders Passaic Co., Court House, bids about Feb. 1, 8 story, basement, brick, steel, rein.-con., plain found., Grand St. between Spring and Jackson Sts. $1,000,000. H. B. Crosby, 125 Ellison St., archt. Noted Nov. 21.

N. Y., Mount Kisco — FIRE HOUSE AND MUNICIPAL—Village, bids about Mar. 1, fire house and municipal building, $150,000. W. Schmidt, 1440 Bway., New York, archt. Noted Dec. 12.

CONTRACTS AWARDED

Conn., New London—MUSEUM—Connecticut College for Women, H. Allyn Estate, 2 story, 90 x 110 ft., granite art and science museum, H. Wales Lines Co., 134 State St., Meriden. Est. $250,000. Contractor closing on sub-contracts. Noted Dec. 19.

BUILDINGS—UNCLASSIFIED

PROPOSED WORK

Calif., Fresno—WAREHOUSE—Peck & Hill Furniture Co. plans by A. C. Martin, Higgins Bldg., Los Angeles, 2 story, 100 x 150 ft., rein.-con.

Ky., Louisville—EXCHANGE and OFFICE—Southern Bell Telephone & Telegraph Co., 415 South 5th St., plans by Maryee-Alger & Vinour, Walton Bldg., Atlanta, Ga. (1st unit) 10 story (ultimataely 19 story), basement, 122 x 147 ft., rein.-con., brick, steel, Chestnut St. and Armory Pl. $1,500,000. Total $5,000,000. Noted July 24.

Md., Baltimore—GARAGE—Wyatt & Nolting, archts., Keyser Bldg., soon lets contract 7 story, basement, sub-basement, 190 x 195 ft., brick, concrete, steel, St. Paul and Saratoga Sts., for St. Paul Garage Co., c/o A. P. Strobel, 812 North Charles St. $750,000.

N. J., Asbury Park—PUBLISHING PLANT—Asbury Park Press, J. L. Kinmouth, pres., 605 Mattison Ave., plans by E. A. Arend, Kinmouth Bldg., 3 story, basement, brick, steel addition, plain found., Mattison Ave. $150,000.

N. J., Jersey City—EXCHANGE—New Jersey Bell Telephone Co., 540 Broad St., Newark, bids in February, 2 story, basement, brick, steel addition, plain found., 783 Summit Ave. $150,000. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts. Noted Nov. 21.

N. J., Metuchen—HOME for AGED—Danish Brotherhoods and Sisterhoods of Eastern States, H. Nielson, secy., Stephen St., South River, sketches 2 story, basement, brick, steel, plain found., Old Durham Rd. $150,000 funds being raised for same.

N. J., West New York—GARAGE and SHOWROOM—C. H. A. Miller, archt., 322 15th St., bids after Jan. 15, general contract 1 story, basement, 100 x 125 ft., brick, steel, plain found., for O. L. Auf der Heide, 443 16th St. $150,000. North Jersey Auto Sales Co., 729 Bergenline Ave., lessee. Noted Oct. 10.

N. Y., Yonkers—HOME—Guild for Jewish Blind, 200 West 72nd St., New York, E. Levy, in charge, 565 5th Ave., New York, bids in summer, general contract home for blind, Saw Mill River Parkway. $500,000. W. Katz, Yonkers, archt. Noted Sept. 26.

O., Cleveland—EXCHANGE—Ohio Bell Telephone Co., c/o G. A. Kositsky, ch. engr., 750 Huron Rd., sketches by A. W. Bailey, c/o owner, 2 or 4 story, brick, steel, concrete addition, West 65th St. and Guthrie Ave. $200,000.

Ont., London—REPEATER STATION—Bell Telephone Co., R. Stratton, mgr., soon takes bids 2 story, 70 x 100 ft. $250,000.

BIDS ASKED

N. J., Wickatunck—INSTITUTION—Dec. 31, by W. J. Boegel, archt., 185 Madison Ave., New York, 4 story, basement, 43 x 184 ft., and 40 x 86 ft., rein.-con., brick, steel, plain found., for House of Good Shepherd. Noted Dec. 12.

N. Y., Yonkers—LABORATORIES and OFFICE—Dec. 28, by Boyce Thompson Institute, 2 story, laboratories and office, North Bway. and O'Dell Ave. $400,000. F. A. Colby, archt., and J. R. Spellman, engr., both 70 5th Ave., New York. Noted Nov. 28.

Pa., Pittsburgh—EXCHANGE—W. F. Trimble & Sons Co., general contractor, 1719 Penna. Ave., soon takes sub-bids for 23 story, basement, 60 x 120 ft., brick, hollow tile, Cherry and Strawberry Way, for Bell Telephone Co., 416 7th Ave. J. T. Windrim, Commonwealth Bldg., Phila., archt. Noted June 27 under "Contracts Awarded."

CONTRACTS AWARDED

Ill., Peoria — INTERURBAN STATION and OFFICE—Illinois Terminal R.R., Champaign, 2 story, track level, 80 x 90 ft., rein.-con., brick, stone, steel, Adams and Walnut Sts., to V. Jobst & Sons, Lehman Bldg. Est. $150,000. Noted May 23.

Kan., Topeka — EXCHANGE — Southwestern Bell Telephone Co., 11th and Pine Sts., St. Louis, Mo., general contract 51 x 69 ft., rein.-con., brick rear addition, also remodeling present building, to G. Senne Constr. Co., 1017 Kansas Ave., heating and plumbing, to Johnson & Beck, 722 Jackson St. Noted Nov. 7.

Pa., Pittsburgh—AUDITORIUM—Albert H. Kahn, Inc., archts., 1000 Marquette Bldg., Detroit, Mich., 2 story, 100 x 360 ft., brick, steel, to George A. Fuller Co., 1138 Munsey Bldg., Washington, D. C., for H. J. Heinz Co., 1062 Progress St. Total est. $1,000,000. Noted Dec. 19.

Buildings—Industrial

FACTORIES AND MILLS

PROPOSED WORK

Calif., Lodi—PLANT—S. Castorina plans by A. C. Martin, archt., Higgins Bldg., Los Angeles, 4 story, rein.-con., at distillery plant. $200,000.

Factories and Mills (Continued)

Ill., Chicago—MACHINE SCREW FACTORY—A. S. Alschuler, archt., 28 East Jackson Blvd., soon lets contract 3 story, basement, 80 x 300 ft. addition, for Pheoll Mfg. Co., 5700 West Roosevelt Rd.

Ill., Springfield — FACTORY — Allis-Chalmers Mfg. Co., O. Falk, pres., 62nd and Greenfield Sts., sketches 1 story, rein.-con., brick, $150,000. Klug & Smith, 69 East Wisconsin Ave., Milwaukee, Wis., engrs.

N. J., Jersey City—PLANT—Idealite Lamp Shade Co., 836 Bway., New York, altering 4 story plant, 49 Fremont St. To exceed $40,000.

N. J., Little Falls—LAUNDRY—Little Falls Laundry Co., Main St., plans by F. W. Wentworth, 140 Market St., Paterson, 1 story, 65 x 100 ft., brick, steel addition, plain found., Main St. $40,000. Noted Dec. 5.

N. Y., Endicott—FACTORY—C. H. Higgins, archt., 101 Park Ave., New York, bids after Feb. 1, 4 story factory, International Business Machine Corp., 50 Broad St., New York. Noted Nov. 7.

N. Y., Hornell—PLANT—Huguet Silk Co., 188 Thascher St., plant addition. $100,000. Pierce & Bickford, 215 Water St., Elmira, archts. Maturity in summer. Noted May 30.

N. Y., Lynbrook — ICE PLANT — Knickerbocker Ice Co., 41 East 42nd St., New York, plans by A. A. Abrams, Lynbrook, ice plant, Merrick Rd. $60,000.

N. Y., Long Island City—FACTORY—Colorcraft Corp., 122 West 42nd St., plans by J. M. Blauey, c/o owner, 2 story, 6th and Washington Aves. $60,000.

N. Y., New York — LAUNDRY — Nosalc Corp., A. Strauss, pres., bids after February, 1 story, 56 x 194 ft. laundry, Sound View and Paterson Aves. $40,000. R. Shutkind, 147 4th Ave., archt. Noted Dec. 19.

N. Y., Oswego—CHEMICAL PLANT—Floyd L. Carlisle & Co., 15 Broad St., New York, chemical plant. $500,000. Maturity late in 1930. Noted Sept. 27, 1928.

N. Y., New York — FACTORY, LOFT and STORAGE — One Hundred 6th Ave. Corp. and V. Green, 45 West 34th St., 85 x 191 ft., brick, steel, 100 6th Ave. $1,300,000. Shampan & Shampan, 188 Montague St., Brooklyn, archts. Noted Dec. 12.

N. Y., New York—PLANT—R. Hoe & Co., 138th St. and East River, plans by F. S. Parker, 119 West 57th St., 3 story, plant press manufacturing, Walnut St. near 137th St. $125,000.

O., Cleveland—STEEL PLANT—Otis Steel Co., E. J. Kulas, pres., 3341 Jennings Rd., steel plant expansions. $10,000,000. Private plans.

Tex., San Antonio—COLD STORAGE WAREHOUSE—Scobey Fireproof Storage Co., c/o F. E. Scobey, pres., 315 North Medina St., bids after Jan. 1, 4 story, basement, 100 x 166 ft., concrete, plain found., 100,000 sq.ft. floor space, Medina St. $200,000. Engineering Serv. Corp., 1807 Post Dispatch Bldg., Houston, and c/o owners, San Antonio, archts. and engrs. Noted Oct. 17.

BIDS ASKED

Ill., Danville — FACTORY — C. M. Lewis, archt., Adams Bldg., bids in January, 1 story, L shaped, 25,000 ft. floor space, brick, steel, for Electric Coal Mining Machine Co., 309 St. Johns Court.

Mich., Detroit—BAKERY—Mueller & Krecke, archts., 1001 American Radiator Bldg., bids about Jan. 10, 2 story, basement, 60 x 120 ft., concrete, brick, steel, plain found., Tireman Ave. $50,000. Noted Dec. 5.

N. J., Newark—SERVICE and GARAGE—Warner Quinlan Co., Inc., 2 Park Ave., New York, taking bids general contract 2 story, 50 x 130 ft., brick, steel, rein.-con., plain found., Broad St. $160,000. Howard & Frenaye, 2 Park Ave., New York, archts.

N. Y., Brooklyn—FACTORY—See "Contracts Awarded."

Pa., Ambridge—MANUFACTURING PLANT—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Watertown — MANUFACTURING — J. W. Greer Co., 110 Windsor St., Cambridge, 2 story, 80 x 500 ft., brick, concrete, plain found., Grove St., to Tredennick-Billings Co., 10 High St., Boston. Est. exceeds $40,000.

N. J., Paterson—SILK DYEING and FINISHING PLANT—Lanza Silk Dyeing Co., 20 Bridge St., general contract 1 story, basement, 75 x 190 ft., brick, steel, plain found., 335-39 Hudson Blvd., to Gilmore Bros., Inc., 679 Market St. Est. $47,000.

N. Y., Brooklyn—FACTORY—Thames Trading Co., L. Hirsch, 47 Thames St., 4 story, 100 x 200 ft., separate contracts. $350,000. M. Klein, 65 Court St., archt. Noted Oct. 24.

Pa., Ambridge—MANUFACTURING PLANT—National Electric Products Co., N. C. Lamont, genl. mgr., 14th St., 1 story, 125 x 180 ft., steel, 14th and Duss Sts., separate contracts, $50,000. S. F. Mali, 4th St., engr. Steel awarded to Jones & Laughlin Steel Co., Ross St.

Pa., Phila.—CELLULOID FACTORY—E. A. Stopper, archt., 10 South 18th St., 2 story, basement, 110 x 220 ft., brick, steel, plain found., to A. Raymond Raff Co., 1635 West Thompson St., for Bachman Bros., Inc., 609 Commerce St. Est. $200,000. Noted Dec. 12.

GARAGES

PROPOSED WORK

Mass., Abington—Angrley Bros., Washington St., 1 story, concrete service and repair garage, Bedford St. and Brickton Ave. $40,000 or more. Private plans.

Mass., Lowell—Marden & Murphy, Inc., 17 Jackson St., soon lets contract auto repair and service garage, Jackson St. $50,000. H. E. Byam, 45 Merrimac St., archt.

N. J., Passaic—Owner, c/o F. P. Friedman, archt., 395 Springfield Ave., Newark, sketches 1 story, basement, 140 x 150 ft., brick, steel garage and repair station, plain found. $150,000.

N. Y., Astoria (sta. Long Island City) — Daljo Corp., 31-11 Grand Ave., bids in spring, general contract 90 x 175 ft., brick, concrete, 16th and Wilson Aves. $40,000. A. H. Eccles, 76 Hoyt St., archt. Noted Apr. 18.

N. Y., Long Island City—Nash-Queens Motor Co., bids in spring, general contract 3 story, 125 x 168 ft., concrete, Parkson Blvd. and Hillside Ave. $250,000. B. Gunlach, 597 5th Ave., New York, archt. Noted Sept. 27, 1928.

N. Y., New York—H. Neiberg bids in January, general and separate contracts 3 story service garage and mortuary, 138 Ludlow St. $60,000. M. Margolin, 105 Court St., Brooklyn, archt.

N. Y., New York—Risbach Realty Co., H. F. Fischbach, pres., 226 East 41st St., plans by H. Ginsberg, 205 East 42nd St., 5 story, 75 x 100 ft., brick, concrete service garage, 329 East 21st St. $150,000.

N. Y., Richmond Hill—Metz Bros., 129th St. and Metropolitan Ave., plans by W. Doyle, 11 John St., New York, 112 x 240 ft., brick, concrete, incl. showroom, 129th St. and Metropolitan Ave. To exceed $40,000. Maturity in spring. Noted Nov. 21.

N. Y., St. George—Dpt. Water Supply, Gas & Electricity, J. J. Dietz, comr., Municipal Bldg., New York, plans by Sibley & Fetherston, 205 East 42nd St., New York, 42 x 73 ft. garage and repair shop, Ontario Ave. and Victory Blvd. $80,000.

BIDS ASKED

N. Y., Astoria — See "Contracts Awarded."

N. Y., Elmhurst—See "Contracts Awarded."

N. Y., Flushing—See "Contracts Awarded."

N. Y., St. George—See "Contracts Awarded."

CONTRACTS AWARDED

N. Y., Astoria—J. Goldberg, service garage, separate contracts or day labor. $40,000. Maturity after Feb. 1. Cohn Bros., 363 Stone Ave., archts. Noted July 18.

N. Y., Elmhurst—Cord Meyer Co., 1 story, 100 x 200 ft., brick, tile, concrete service garage addition, separate contracts. $100,000. R. Lappan, Forest Hills, archt. Noted May 16.

N. Y., Flushing—Prisco & Soriero, Inc., 9073 Sutphin Blvd., Jamaica, 1 story, 49 x 298 ft., brick, separate contracts. $100,000. W. C. Winter, 2772 Fulton St., Brooklyn, archt. Maturity in spring. Noted Apr. 12, 1928.

N. Y., Flushing—Sheffield Farms, 524 West 57th St., New York, general contract 1 story, 52 x 156 ft., brick, 35th Ave. and Prince St., to F. Droesch, 110-18 Jamaica Ave., Jamaica. Noted Oct. 3 under "Garages."

N. Y., St. George — O. F. Koehler, Inc., Wagner College, 3 story, 89 x 120 ft. service garage, Monroe Ave. and Fort Pl., day labor and separate contracts. $90,000. Maturity in summer.

N. Y., Woodside—Realty Associates, 162 Remsen St., Brooklyn, three 100 x 200 ft. garages, separate contracts. $150,000. B. Diesker, Jr., 162 Remsen St., Brooklyn, archt. Noted July 4.

O., Cleveland—Standard Oil Co., c/o E. B. Wagoner, East Ohio Gas Bldg., four 1 story, 25 x 70 ft., brick lubritoriums at Page and Euclid Aves., East 105th St. and Ashbury Ave., Wade Park Ave. and Crawford Rd., Wyandotte and Madison Aves., to Gilchrist Constr. Co., Western Reserve Bldg. Est. $150,000.

SHOPS AND FOUNDRIES

PROPOSED WORK

California—SHOPS—See "Railways."

N. Y., New York—SHOP—C. E. Appleby, 17 John St., plans by R. C. Clark, 491 West 30th St., 90 x 117 ft., brick blacksmith shop, laundry. 602 West 40th St. $200,000.

N. Y., Mount Pleasant—SHOP—J. Polchinski, c/o Palmer & Plousky, archts., 55 William St., New York, stone cutting shop and display room. $40,000. Maturity in late spring.

Pa., Pittsburgh—FOUNDRY and OFFICE—Reliance Steel Castings Co., 28th and Smallman Sts., plans by Lake & Davidson, Negley Bldg., brick, steel, 28th and Smallman Sts. $50,000. Work will probably be done by separate contracts.

BIDS ASKED

N. Y., Port Richmond—SHOP and FOUNDRY—See "Contracts Awarded."

N. Y., Raybrook—SHOP—Jan. 9, by Superintendent Div. Standards & Purchase, Executive Dpt., Albany, paint and repair shop, and replacing stairways in Pryor and MacDonald Wings, New York State Hospital for Treatment of Incipient Pulmonary Tuberculosis. adv. E. N.-R. Dec. 26.

CONTRACTS AWARDED

N. Y., Long Island City — SHOP — T. J. Rumney, 81 Hancock Pl., 1 story, 50 x 120 ft. welding shop, Hancock St. and 43rd Rd., to Bonafide Building Corp., 2726 Jackson Ave.

N. Y., Port Richmond—SHOP and FOUNDRY—United Dry Docks, Inc., shop and foundry, Mesereau Ave. and Davidson St., separate contract and day labor. $80,000.

Pa., McKeesport — FOUNDRY, MACHINE SHOP and WAREHOUSE—Columbia Radiator Co., F. C. Painter, secy.-treas., 3200 Walnut St., 1 story, 100 x 450 ft., brick, steel, to Austin Co., Union Trust Bldg., Pittsburgh. Est. $250,000. Noted Nov. 21.

POWER PLANTS

PROPOSED WORK

Ark., Morrilton—See "Waterworks."

Mass., Boston—Edison Electric Illuminating Co., 39 Boylston St., steam heating plant, brick, Kneeland and Utica Sts. To exceed $40,000. I. E. Moultrop, 39 Boylston St., companies, engr.

N. Y., St. George—Dpt. Parks, W. J. Herrick, pres., Park Bd., Arsenal Bldg., Central Park, New York, plans by Sibley & Fetherston, 205 East 42nd St., New York, 2 story, 75 x 136 ft. boiler room and shops, Drake and Slosson Aves. $50,000.

BIDS ASKED

Mich., Detroit—See "Contracts Awarded."

Mich., Pontiac—Dec. 30, by Bd. Supervs., Oakland Co., Court House, 1 story, basement, concrete, brick, steel power house for unit of hospital group, plain found., Cooley Lake Rd. F. D. Madison, Royal Oak, archt.

CONTRACTS AWARDED

Ia., Audubon—Iowa Public Serv. Co., 1 story, part basement, 50 x 80 ft., concrete, brick, Market St., to Zitterell-Mills Constr. Co., Webster City. Est. $40,000.

Mass., East Braintree (mail Braintree) — Old Colony Gas Co., Quincy Ave., 1 story, brick, steel engine room, near Quincy Ave., to T. Mulcare Co., Inc., 66 Western Ave., Brighton. Est. $40,000.

Mich., Detroit—Detroit Edison Co., 2000 2nd Blvd., 3 story, basement, 100 x 150 ft., rein.-con., brick, steel substation, plain and caisson found., Howard St., separate contracts. $375,000.

B. C., Victoria—British Columbia Electric Ry. Co., Victoria and Vancouver, 5,250 ft. 48- to 60-in. steel penstock for Jordon River Hydro-Electric Power Station, to Vancouver Eng. Wks. Ltd., 519 6th Ave. W., Vancouver. $386,000; water wheel and generator for 4th unit, to English Electric Co. of Canada, 1140 Hamilton St., Vancouver, $160,000; transformers, to Canadian Westinghouse Co., 602 Hastings St. W., Vancouver, $55,000. Noted Aug. 8.

WAREHOUSES

PROPOSED WORK

N. Y., Jamaica—New York Avenue Holding Corp., G. M. Gross, pres., 160-16 Jamaica Ave., plans by M. Klein, 65 Court St., Brooklyn, 1 story, 75 x 361 ft. industrial warehouse, New York Blvd. and Jamiaca Ave. $150,000.

N. Y., New York—Manhattanville Realty Co., 526 11th Ave., plans by O. L. Spenshake, 116 Nassau St., 12 story, 74 x 100 ft., brick, steel storage warehouse, 526 11th Ave. $400,000.

N. Y., Rensselaer—Shell Petroleum Co., and A. J. Kennedy Co., Utica, warehouse, storage tanks for central oil plant. $280,000.

Pa., Reading—See "Railways under Pennsylvania."

Ont., Port Stanley—Dominion Govt., Ottawa, freight warehouse on government docks, $75,000, dredging $35,000, repairing pier, $50,000.

BIDS ASKED

Mich., Detroit—Pollmar & Ropes, archts., 703 Hoffman Bldg., taking bids and open same about Jan. 10, 1 story, 125 x 400 ft., concrete, brick, steel, Griswold St. and Detroit River, for Detroit & Cleveland Navigation Co., Wayne St. and Detroit River. $150,000. Foundation for same, awarded to A. J. Dupuis Co., 1210 Ford Bldg. Noted Dec. 12.

Ont., Windsor — Dec. 27, by N. Desjardins, acting secy. Dpt. P. Wks., Ottawa, 2 extensions to government warehouse and other improvements at government wharf.

CONTRACTS AWARDED

N. Y., Astoria—M. A. Curcie, 336 Steinway Ave., 3 story industrial warehouse, to F. Benson, 2316 Bway., Long Island City. Est. $50,000.

Pa., Pittsburgh—Atlantic & Pacific Tea Co., Grant Bldg., general contract 2 story, basement, 160 x 252 ft., rein.-con., brick, steel, 41st St. and A. V. R.R., to Foster Eng. Co., 726 Indiana Ave., Indianapolis, Ind. This corrects report in Dec. 5 issue.

See proposal advertising on page 97

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UNIT PRICES

Sewage Treatment Works— New Haven, Conn.

Advisory Board of East St. Disposal Plant, City Hall, opened bids Nov. 8, sewage treatment works and appurtenances at East River sewer outlet. Bidders are: (A) C. W. Blakeslee & Sons, 58 Waverly St., (awarded contract using Link belt screen, Dorr grit chamber and sludge removal apparatus); (B) A. Phelps & Sons, 6319 Michigan Ave., Detroit; (C) Merritt-Chapman & Scott, 192 Pequot St., New London; (D) Maggi & Schoonover, 9 Colt St., Paterson, N. J. Fuller & McClintock, 170 Bway., New York, engineers.

	A	B	C	D
1,000 lin.ft. test borings	$3.25	$4.50	$2.00	$2.00
900 lin.ft. test piles	1.25	4.25	1.50	1.50
12,500 cu.yd. earth excav.	1.90	2.00	1.10	1.10
50 cu.yd. rock excav.	1.00	15.00	40.00	40.00
44,000 lin.ft. piles to length of 35 ft. below cutoff	.75	.80	.80	.85
1,000 lin.ft. additional length of piles	1.40	2.00	1.50	1.50
5,000 lin.ft. reinforced concrete piles	3.85	2.75	3.40	3.40
7, Cofferdams (lump sum)	41,750.00	92,000.00	60,000.00	66,000.00
7A alternate cofferdams	+455.00	+10,000.00	+3,000.00	−3,000.00
650 cu.yd. conc. 9 in. or less	21.50	21.00	30.00	27.50
4,200 cu.yd. conc. over 9 in.	20.00	16.00	22.00	20.00
4,000 cu.yd. conc. for foundations	14.00	10.05	11.00	12.00
535,000 lb. steel reinforcement	.04	.04 1/80	.06	.09
48,000 sq.ft. waterproofing concrete	.035	.05	.05	.05
70 tons c. I. B. & S. pipe	100.00	80.00	73.00	70.00
10 tons c. I. B. & S. specials	200.00	164.00	160.00	180.00
56 tons flanged pipe and specials	210.00	199.00	200.00	240.00
36,000 misc. cast iron and steel	.15	.13	.10	.15
3,150 lin.ft. pipe railing	1.50	1.20	2.00	2.50
Venturi rate controller (lump sum)	6,000.00	7,000.00	6,000.00	6,750.00
20 M.ft. b.m. lumber for fenders, etc.	160.00	150.00	150.00	154.00
Superstructures (lump sum)	46,275.00	22,250.00	40,000.00	39,500.00
Gate valves and sluice gates (lump sum)	14,000.00	11,500.00	13,640.00	15,200.00
Pumping and mechanical equip. (lump sum)	17,790.00	24,700.00	18,000.00	20,480.00
23A, mechanically cleaned bar screen (Link Belt) (lump sum)	5,934.00	4,500.00	4,000.00	5,630.00
23B alternate (Dorr)	6,570.00	6,400.00	5,700.00	6,663.00
24A grit chamber cleaning mechanism (Dorr) (lump sum)	7,930.00	8,600.00	7,500.00	8,470.00
24B Alternate (Link Belt)	6,000.00	6,150.00	4,500.00	6,040.00
25A, sludge removal apparatus (Link Belt) (lump sum)	17,000.00	13,300.00	13,400.00	17,116.00
25B, alternate (Dorr)	35,000.00	36,000.00	31,000.00	35,840.00
Alternate	24,500.00			
4 sludge storage and decantation tanks	2,270.00	2,275.00	2,100.00	2,770.00
2,000 lin.ft. sheet copper joint strips	.70	.54	.60	.80
100 lin.ft. pipe insulation	11.85	3.00	5.00	2.00
Laboratory equipment	500.00	500.00	500.00	500.00
1,500 cu.yd. gravel for foundations	2.00	2.50	3.00	6.00
1,700 lin.ft. w.i. water main	2.50	.75	2.00	2.85
Load test on East St. sewer	290.00	800.00	500.00	1,000.00
To remove stranded barge	1,000.00	1,000.00	1,000.00	1,000.00
Total using items 7,23A, 24B, 25A	$468,419	$461,191	$473,550	$517,861
Total using items 7A, 23B, 24A, 25B	489,440	498,241	498,850	537,048
Total using items 7A, 23A, 24A, 25B	488,804	496,341	497,150	536,015

Engineering News-Record, Issue of December 26, 1929.

Bridge—Florida

State Road Department, Tallahassee, opened bids Oct. 28, Peace River Bridge between Punta Gorda and Charlotte Harbor, Charlotte Co., 4,378.4 ft. long. Six bids were received, difference between lowest and average 8 per cent. Lowest three and highest bidders are: (A) Raymond Concrete Pile Co., 140 Cedar St., New York, (awarded contract); (B) McDougald Construction Co., Atlanta; (C) C. E. Hillyer, Jacksonville; (D) Hardaway Contracting Co., Columbus, Ga. B. M. Duncan, state highway engineer.

	A	B	C	D
836.6 cu.yd. conc. seal	$30.00	$24.50	$40.00	$32.25
1,084 cu.yd. conc. class A-A substructure piers	30.00	28.00	30.00	33.25
1,399.8 cu.yd. conc. class A-A substructure pile caps	30.00	23.00	30.00	33.25
8,135 cu.yd. conc. class A-A superstructure	32.30	26.50	30.00	33.25
8,580 lin.ft. conc. handrail	2.50	2.42	3.50	2.00
4,513,000 lb. reinforcing steel	.042	.04	.05	.04
44,505 lb. structural steel	.09	.075	.15	.10
3.4 M. ft.b.m. treated fender timber	162.00	150.00	250.00	200.00
1,200 lin. ft. treated fender piling	1.20	1.30	1.20	1.50
11,000 lin.ft. untreated foundation piling	.33	.53	.40	.75
52,920 lin.ft. pre-cast conc. piling	3.00	4.60	3.00	5.50
605 lin.ft. pre-cast conc. piling (test)	8.00	6.50	5.00	10.00
1 loading test piling	1,600.00	1,800.00	560.00	1,000.00
7 loading each add'n'l test piling	175.00	1,000.00	460.00	500.00
4,240 lin.ft. conc. sidewalk	1.57	1.60	1.85	2.10
68,572 lb. bronze bearing plates	.50	.45	.55	.45
82,319 cu.yd. hydraulic embankment	.25	.29	.40	.30
Removal of existing bridge	7,500.00	6,500.00	4,500.00	10,000.00
Control house complete	800.00	1,200.00	600.00	500.00
Totals	$819,242	$836,521	$870,225	$969,059

Engineering News-Record, Issue of December 26, 1929.

Highway—Arizona

State Highway Department, Phoenix, opened bids Nov. 4, grading and bridging 22.5 mi. Holbrook-Lupton Highway, F. A. P. No. 23-A. Lowest three and highest bidders are: (A) F. D. Shufflebarger, Albuquerque, N. M., (awarded contract); (B) Lee Moor Contracting Co., El Paso, Tex.; (C) H. C. Lallier, Continental Trust Bldg., Denver, Colo.; (D) J. Mulligan, Mesa.

	A	B	C	D
70,144 cu.yd. excav. roadway (unclass)	$0.465	$0.42	$0.62	$0.89
900 cu.yd. excav. overbreakage	.34875	.315	.465	.6675
107,995 cu.yd. excav. borrow (unclass)	.23	.25	.23	.29
3,122 cu.yd. excav. structures (unclass)	.80	1.25	1.00	1.00
9,921 cu.yd. excav. ditches, channels and dykes (unclass)	.23	.30	.30	.29
53,582 sta. yd. earthwork overhaul	.015	.03	.02	.04
571 cu.yd. class A conc. (C.F.C.)	25.00	25.80	23.00	27.00
852 cu.yd. class B conc. (C.F.C.)	23.00	25.40	23.00	27.00
61,715 lb. reinf. steel (C.I.P.)	.055	.05	.05	.06
300 lin.ft. mesh guard fence (C.I.P.)	1.00	1.00	.80	1.00
1,554 lin.ft. 24 in. C.M.P. (C.I.P.)	3.00	2.76	3.00	3.00
994 lin.ft. 36 in. C.M.P. (C.I.P.)	5.25	5.45	5.50	5.00
STRUCTURES OVER 20 FT. CLEAR SPAN				
1,992 cu.yd. excav. (unclass)	1.25	1.25	1.00	2.25
13 cu.yd. class A-A conc. (C.F.C.)	65.00	60.00	60.00	70.00
1,073 cu.yd. class A conc. (C.F.C.)	25.00	29.00	23.00	27.00
40 cu.yd. class B conc. (C.F.C.)	23.00	28.00	23.00	27.00
96,075 lb. reinf. steel (C.I.P.)	.055	.05	.05	.06
125 cu.yd. rip rap (C.I.P.)	1.50	2.80	2.00	2.50
8 plate bridge seats (C.I.P.)	60.00	25.00	50.00	22.00
342,515 lb. structural steel (C.I.P.)	.082	.0725	.075	.08
Dismantling and piling steel span	350.00	500.00	500.00	100.00
Totals	$176,004	$180,614	$181,839	$223,493

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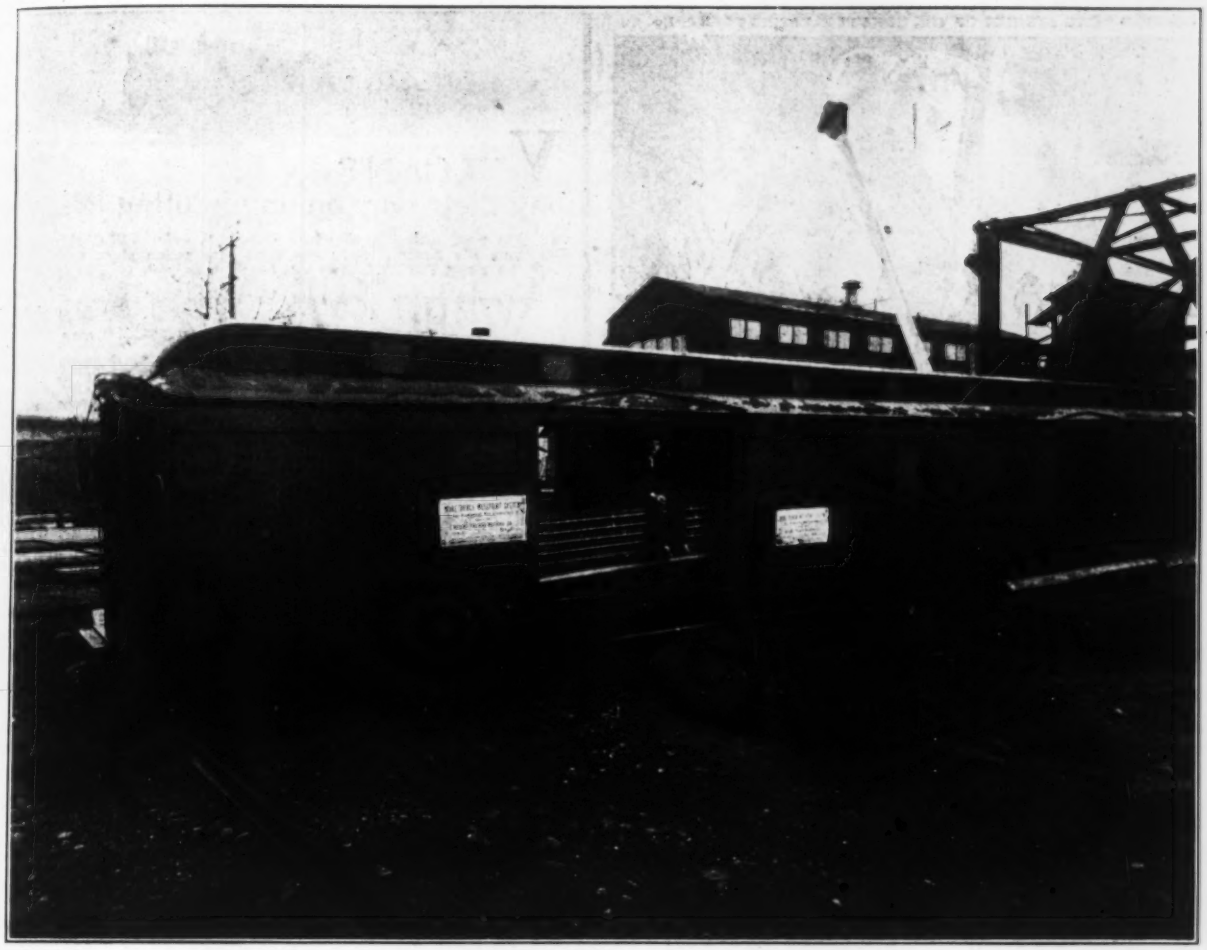

An EXPRESS CAR on the MORETRENCH SIDING

Loaded with a fifteen ton MORETRENCH WELLPOINT SYSTEM. Big Business got tired of fooling with obsolete equipment—tired of hoping that things would get better. So he sent the MORETRENCH MAN up to see the job — got a prescription — ordered the "medicine" by express. Another "doctor" rode up with it and the dose went in as ordered.

It was zero and below but "*it worked while they slept.*" Big Business feels better. His feet are dry. He saved the express bill the first week.

The MORETRENCH WELLPOINT SYSTEM dries up wet excavation—any size—anywhere—any condition.

Outside and Inside Exhibits at the Road Show
January 13-18, Atlantic City

Moretrench

MOORE TRENCH MACHINE CO., *Rockaway, N.J.*

CONVEYING EXCAVATORS
WELLPOINT SYSTEM

WORLD NEWS STORIES OF THE KOHLER ELECTRIC PLANT—No. 10

FILMING THE ROAR OF HOLLYWOOD BATTLES

THE thundering crash of "G. I. cans," the steam-riveter rattle of machine guns—such sounds are easily caught by the sensitive microphones that advance with the first wave in Hollywood's post-war battles.

But, when the cannonading lulls and the heroine bends over our wounded hero, the "sound trucks" that supply electricity for cameras and recording apparatus must be silent as slumber. Shutting out *unwanted* sound is vitally important—and extraordinarily difficult when pictures are taken "on location," away from the sound-tight studio.

Now "talkie" engineers are discovering that Kohler Electric Plants are so quiet and vibrationless that, with proper sound-insulation, they can generate powerful current *anywhere* without interfering with flawless recording of sound effects.

Engineers use Kohler Electricity

Eight Kohler plants are working on sound trucks for four of Hollywood's leading producers—a notable tribute, but fully matched by the high praise won by these plants in many other fields.

Especially noteworthy is the preference won by these plants in the engineering field, where they are lighting excavating projects, trains, and camps, and supplying mobile power. Models from 800 watts to 10 K. W. deliver 110-volt current without storage batteries. Mail the coupon for further information.

KOHLER OF KOHLER

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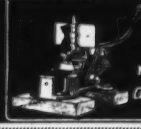

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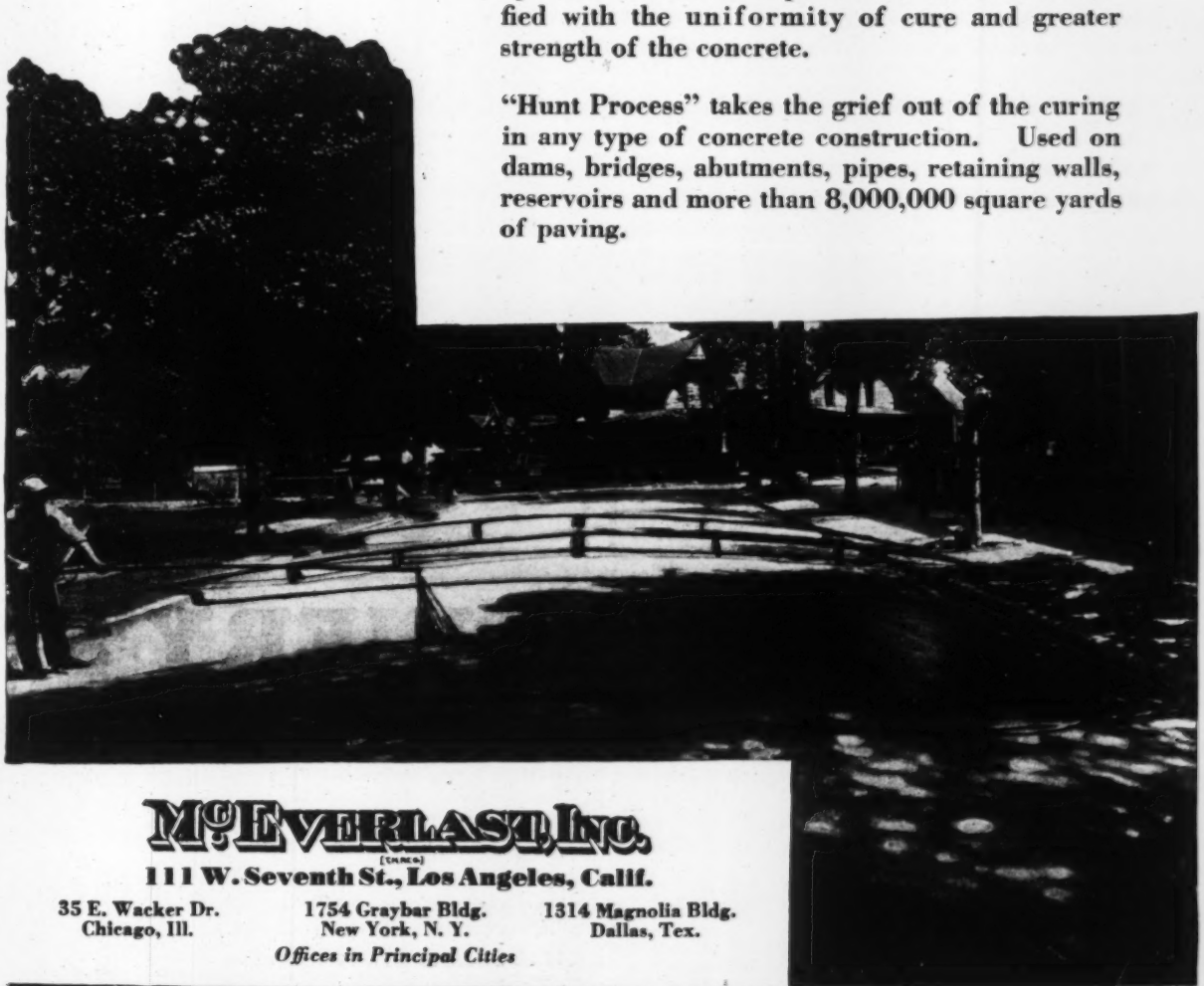

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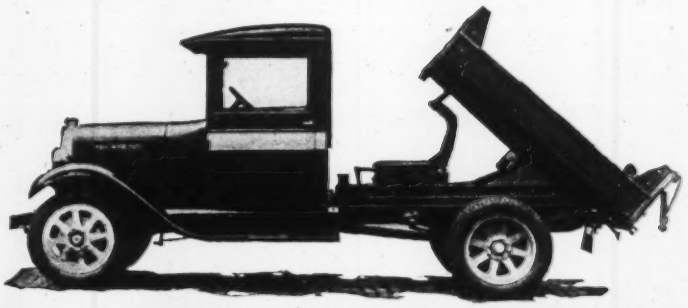

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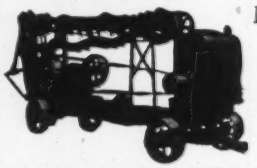

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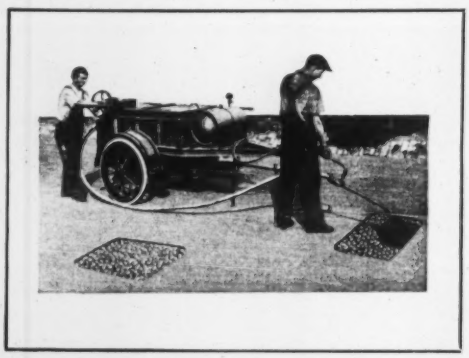

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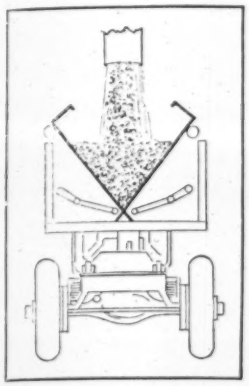
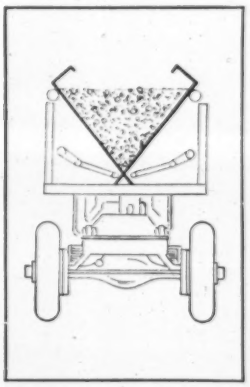
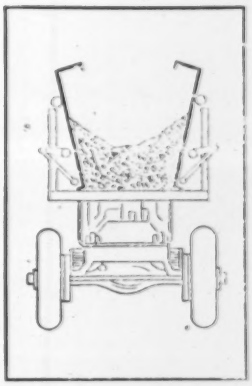


Truck receives Wet Mix from mixer. Body sides in V position.

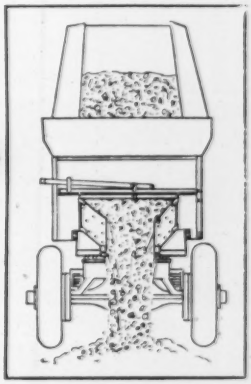


Transporting Wet Mix. Sides in V position.

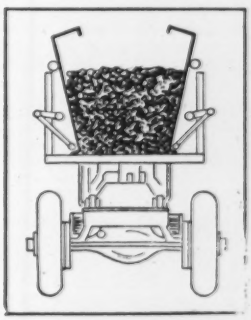


On the job. Sides are swung to vertical position, redistributing grout throughout the mass.

See this truck body in Booth No. 407 at the Atlantic City Road Show.



End gate is opened and body is tilted. The concrete pours out through the end gate, which has a restricted opening and imparts a final mixing action.



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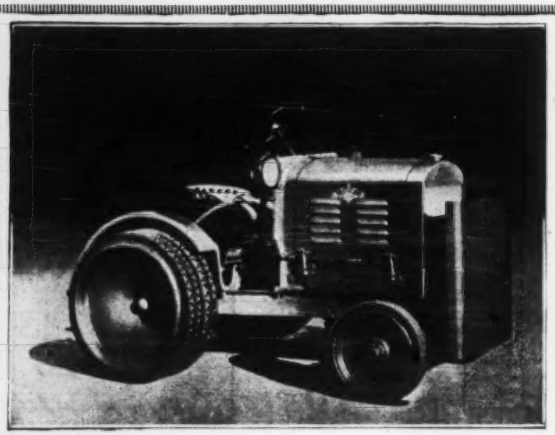

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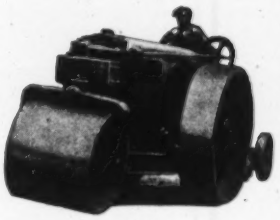

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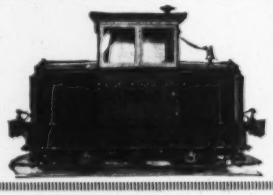

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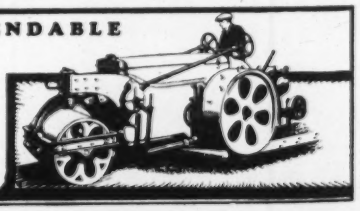

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By John K. Thompson

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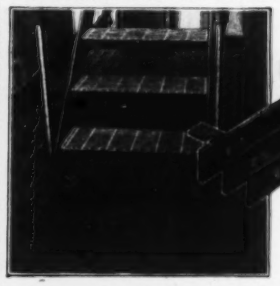

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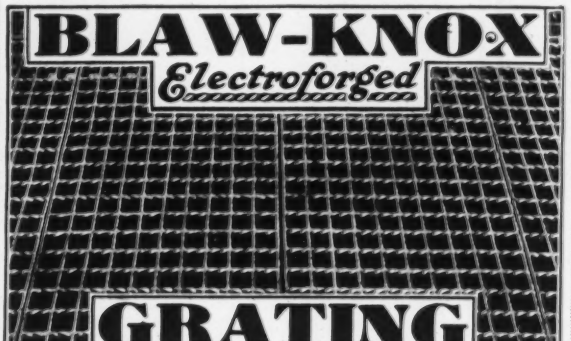

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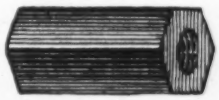

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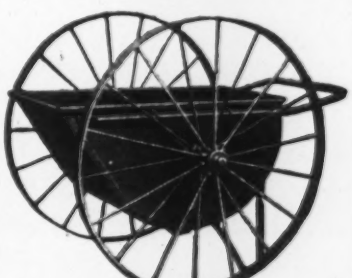

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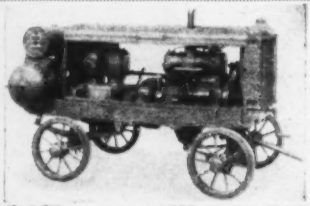

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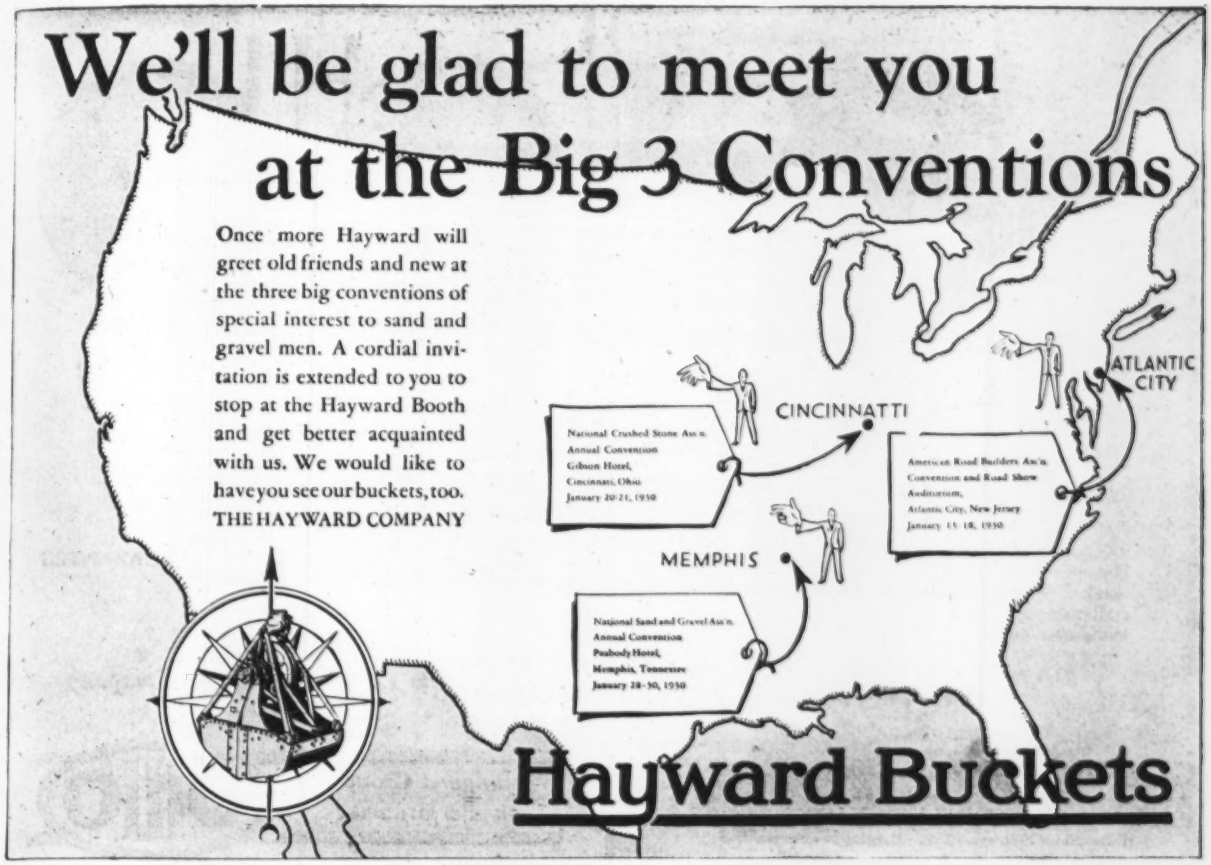
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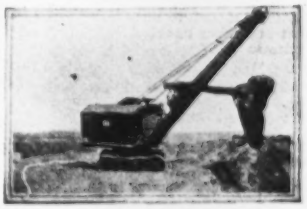

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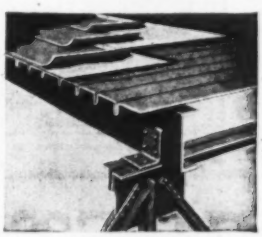

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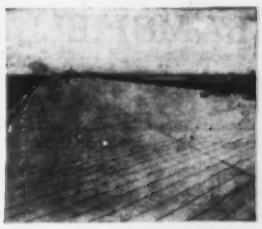

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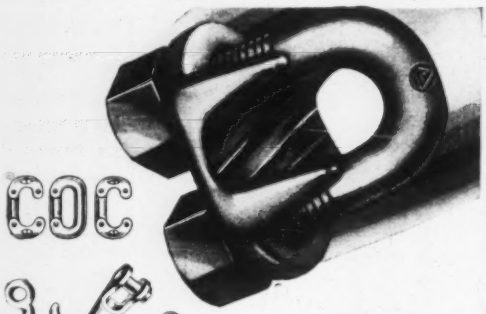

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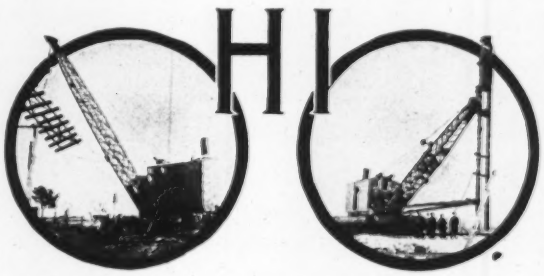

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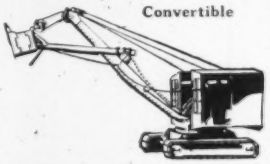

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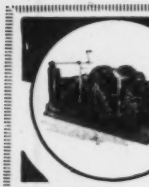

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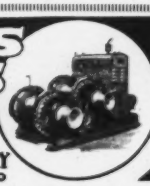

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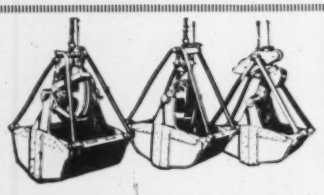

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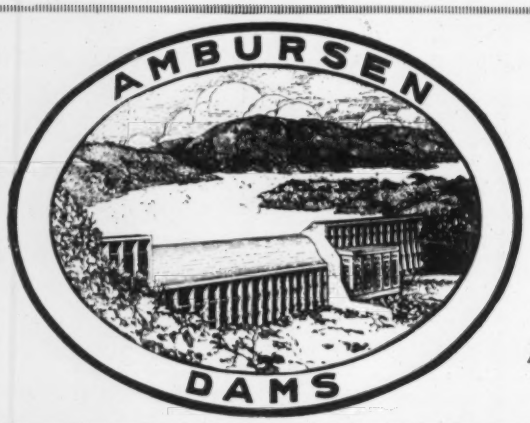

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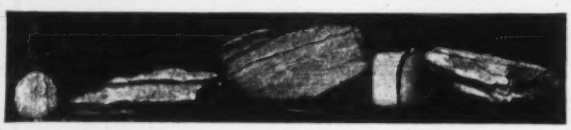

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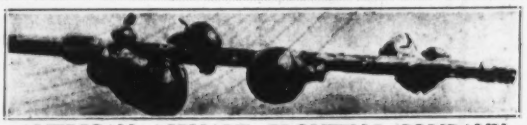

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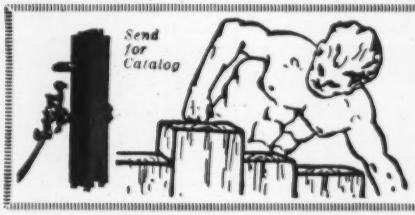

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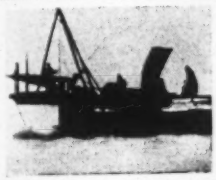

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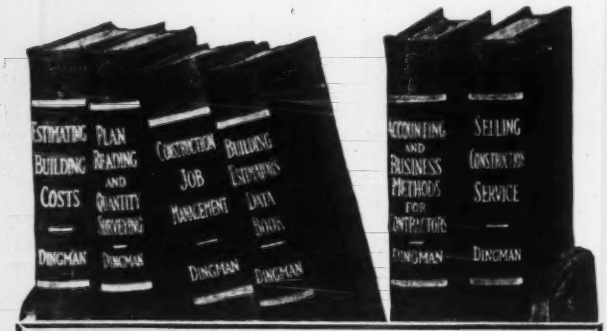

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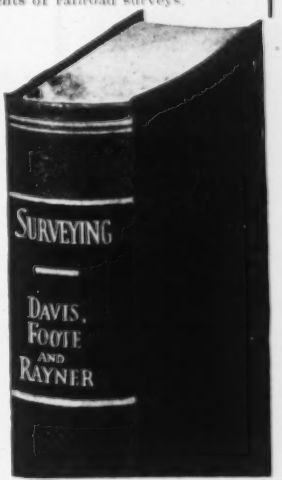

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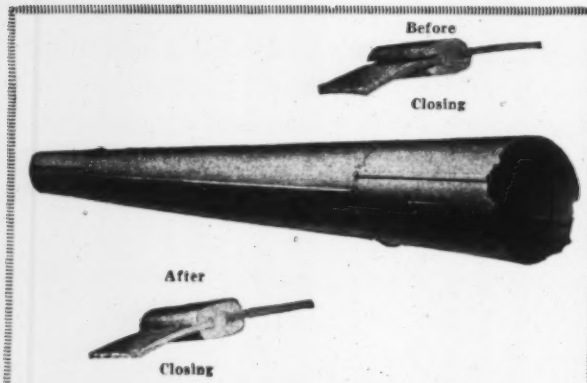

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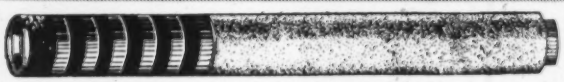

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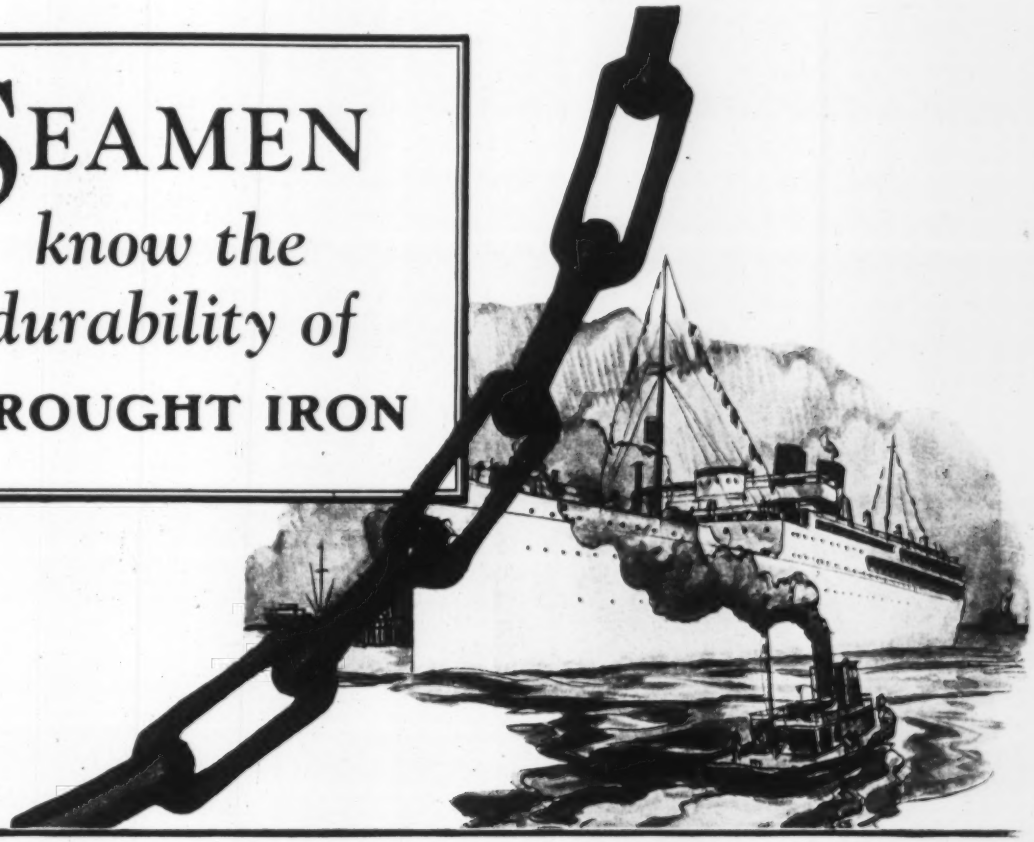

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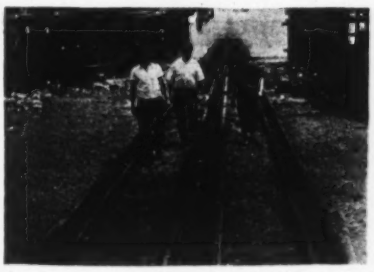

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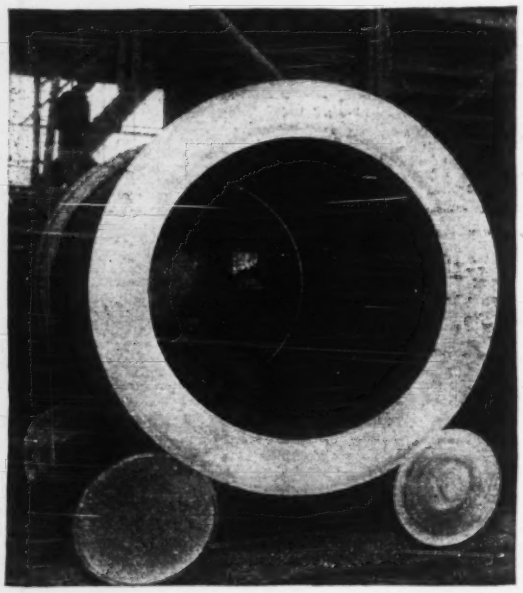

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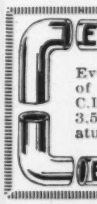

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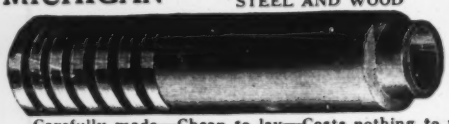

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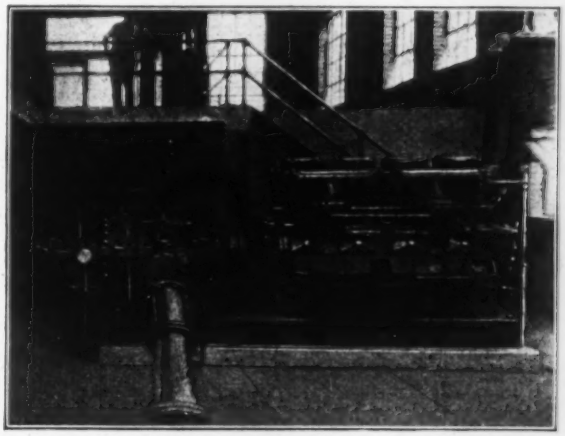

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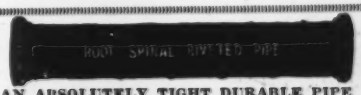

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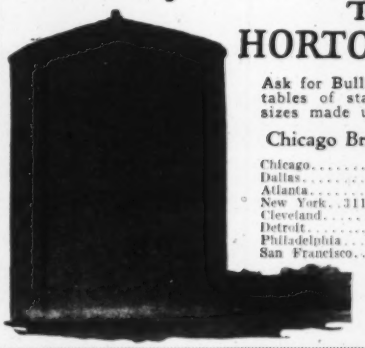

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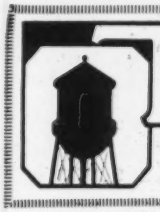

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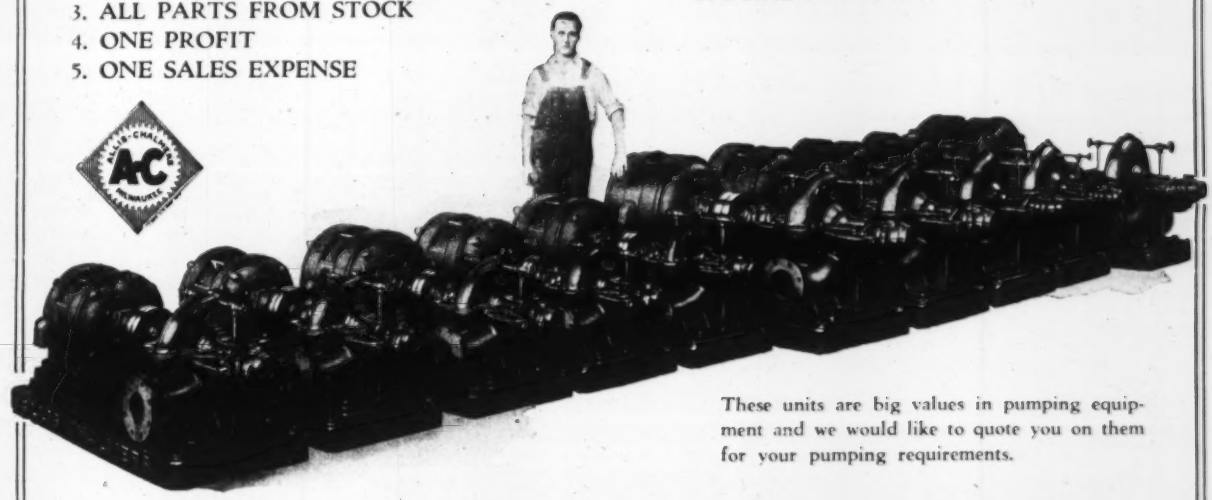

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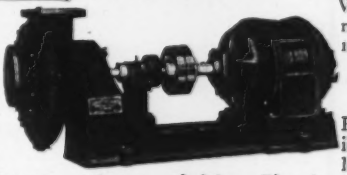

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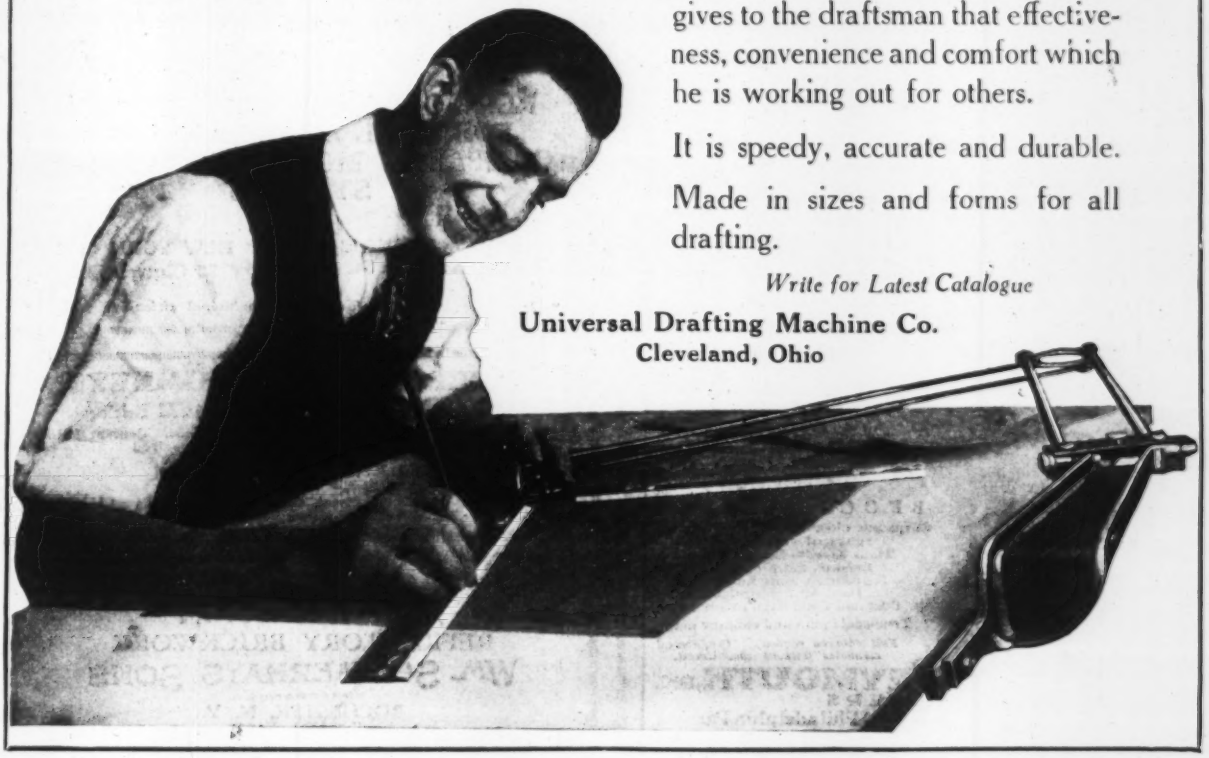

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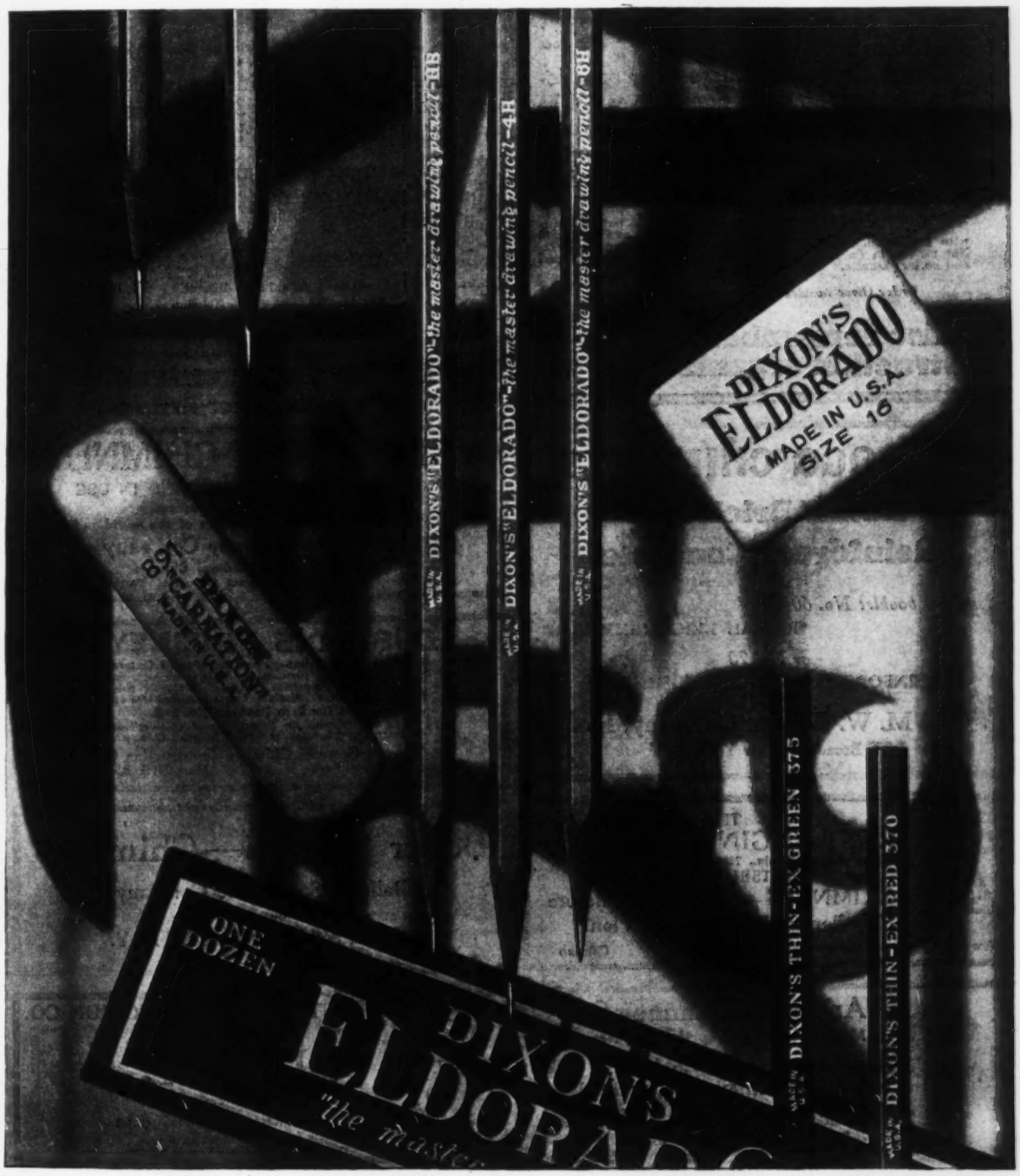

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Perforated Radial Brick Chimneys and Reinforced Concrete Chimneys
Chimneys of all sizes, for all purposes, for boilers, furnaces, chemical plants, destructors, etc. Experts in repairing chimneys. Lightning rods installed and repaired. Specifications, plans, designs and data furnished free upon request.
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American Chimney Corp.

Main Office, 147 Fourth Ave., New York
BRANCHES:
Philadelphia Boston Cleveland Detroit
Brick Chimneys--Boiler Settings
give lasting service under severe operating conditions. Designed and built by men with long experience.

CEMENT-GUN CONSTRUCTION CO.
THE ORIGINAL
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Contractors
Estimates and information cheerfully given
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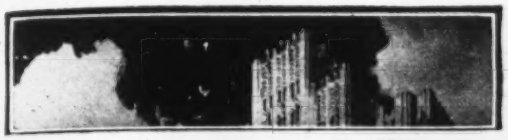

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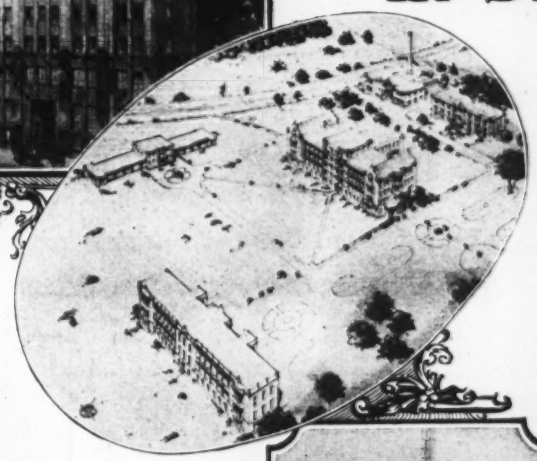
USED IN ALL THE LARGER BUILDINGS

Under Construction in St. Louis



BARNSDALL ADMIX insures permanently stronger concrete buildings, of better appearance, with lower maintenance costs.

It is unique in being the only material combining workability, waterproofing and corrosion-resistance with greatly increased early and final strength.

[The Park Plaza Hotel featured in our advertisement in the November 28th issue of Engineering News-Record is the largest job under construction in St. Louis.]

Continental Life Bldg.
Wm. B. Ittner, Architect,
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St. Louis County Hospital
Aegerter & Bailey, Architects
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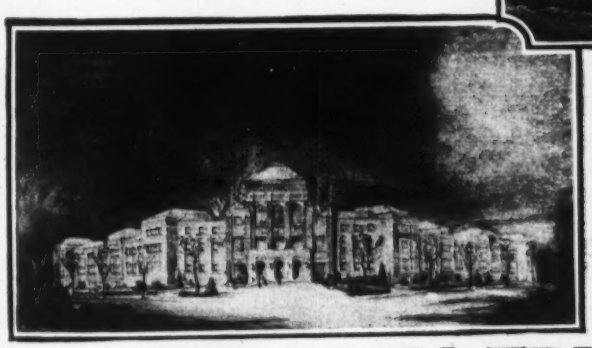
University City High School
Ferrand & Fitch, Trueblood & Graf,
Associated Architects
Martin Engineering Co., Engineers
Murch Bros. Construction Co., Contractors

Junior Kenrick Seminary
Henry P. Hess, Architect
L. M. Dieckmeyer, Engineer
Fred Schirm, Concrete Contractor

Foundation shown at left.



AMERICAN TRIPOLI COMPANY

INCORPORATED 1892

1636 ARCADE BUILDING, ST. LOUIS, MISSOURI

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+ + + Printing *Wealth* + + +

WITH A WHIRR AND A CLATTER the pressroom swings into action. The floor trembles, the lights quiver, the moving maze of steel throbs in the rhythm of its own ponderous dance. A business paper is in the making. Great presses draw in at one end white paper and at the other end pour forth + wealth. For material possessions are not the only wealth of a people. Knowledge is a form of wealth + + knowledge of how to use men and materials and machines to create a wealth greater still. This knowledge + + which economists call fact-wealth, as distinct from material property + + is the wealth which begets wealth.

In the creation of fact-wealth modern business papers play a dominant part. Back of the roaring pressrooms as they pile up fact-wealth in printed form are the news staffs, gathering information at the source, and the editorial staffs, checking and correlating that information. For the business paper's knowledge must be correct + + its readers are experts; they are swift to detect error; they are prompt to appreciate fact. They follow both its reading and its advertising pages intently, for to them the business paper is a very real source of wealth.

As a creator of fact-wealth the modern business paper serves society; it serves its industry or trade; and it serves its individual readers. To this service it owes the honest circulation and the reader interest which make a good advertising medium.

THIS SYMBOL *identifies an ABP paper . . . It stands for honest, known, paid circulation; straightforward business methods and editorial standards that insure reader interest . . . These are the factors that make a valuable advertising medium.*

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This publication is a member of the Associated Business Papers, Inc. . . a cooperative, non-profit organization of leading publications in the industrial, professional and merchandising fields, mutually pledged to uphold the highest editorial, journalistic and advertising standards.

SEARCHLIGHT SECTION

OFFICIAL PROPOSALS

Copy: Official Proposals reaching our New York Office by 10 A.M., Wednesday can usually be printed in the issue out Thursday. Holidays advance ethis time one day.

Rate:

40 Cents a Line an Insertion

Fractional lines count as full lines

Plans and Specifications for inspection by distant bidders may be filed at any of the Engineering News-Record offices without charge.

THESE ARE OFFICIAL NOTICES THAT BIDS ARE WANTED FROM BIDDERS EVERYWHERE

E. N.-R.

OFFICIAL PROPOSALS

Bids: January 23.

Reinforced Concrete Drain

DEPARTMENT OF PUBLIC WORKS
Buffalo, N. Y., December 20, 1929.

Sealed proposals for work and improvement as set forth below, will be received at the office of this Department, Room 3, Municipal Building, until 11 o'clock a.m., January 23, 1930.

No proposal will be considered unless it be accompanied by a certified check or, in lieu thereof, a bid bond, as provided in the specifications. In case of the bidder's failure to enter into the contract for the doing of the work or improvement or to furnish the bond, guaranteeing the performance of the contract, such certified check shall be and become the property of the City of Buffalo as the agreed and liquidated amount of the damages to the City of Buffalo caused by such failure, or if a bid bond was given, then the penalty of such bid bond shall be and become the minimum amount of the damages suffered by the City as liquidated damages caused by such failure.

This Department reserves the right to reject any and all bids, and waive any informalities.

A separate proposal must be made for the work and improvement included in each descriptive paragraph following:

For the construction of an 8½ x 10 and 8½ x 15½ foot double rectangular section reinforced concrete drain between Erie Canal and West line of Niagara Street and an 8½ x 13½ foot reinforced concrete drain in the bed of Cornelius Creek between the West line of Niagara Street and Tonawanda Street.

Work consists of constructing about 1,726 feet of reinforced concrete drain with invert elevation about two feet below normal River elevation; excavating about 15,000 cubic yards of earth.

Bids and contract will be on a lump sum basis.

Plans and specifications, form of contract and proposal blanks will be mailed or may be taken from the office of the City Engineer upon a deposit of $15.00 with the Secretary of the Department of Public Works. Said sum will be returned to the bidders submitting proposals; ten dollars will be returned to those not submitting proposals upon return of plans and specifications in good condition.

Formal advertisement will be found in the Buffalo Courier-Express, Buffalo News and City Record on December 24, 31, 1929.

This is not a formal advertisement.

Bids: January 24.

Constructing Drainage Stations

New Orleans, November 14, 1929.

Separate sealed proposals will be received by the Sewerage and Water Board of New Orleans, at the office of the Secretary, Room 401, No. 526 Carondelet St., New Orleans, up to 12 o'clock, noon, (Central Standard Time) of Friday, January 24, 1930, for the following contracts:

160-D Constructing Drainage Station No. 9.
109-D Extension to Drainage Station No. 2.
110-D Lift Screen for Drainage Station No. 6.
111-D One 3,000 K.W. Transformer for Power House No. 2.
206-D Magellan Open Drainage Canal.
207-D Algiers Outfall Canal
208-D Metaire Relief Outfall Canal.

Plans, specifications and proposal forms may be obtained at the office of the Board. Deposits to guarantee return of plans will be required as follows: Cont. 106-D, $100; 109-D, $200; 110-D, 206-D, 207-D and 208-D, $50 each; 111-D, none. The right is reserved to reject any or all bids.

GEO. G. EARL, General Superintendent.
A. G. MOFFAT, Secretary.

OFFICIAL PROPOSALS

Bids: January 16.

Bridge

Salem, Oregon.

Sealed bids will be received by the Oregon State Highway Commission at the Multnomah County Courthouse, Portland, Ore., at 10 a.m., Thursday, January 16, 1930, for the construction of a Bridge consisting of seven 230 foot concrete arch spans and 328 lineal feet concrete viaduct over the Rogue River between Wedderburn and Goldbeach on the Roosevelt Coast highway in Curry County, Ore., requiring approximately 11,800 cubic yards excavation, 15,500 cubic yards concrete, 1,775,000 lbs. metal reinforcement, 3,824 lin.ft. concrete handrail.

No bids will be considered unless accompanied by cash, bidders bond or certified check for an amount equal to five per cent of the total amount bid. A satisfactory bond will be required for the faithful performance of the contract. Proposal blanks and full information, for bidders may be obtained at the office of the State Highway Commission, Capitol Building, Salem, Ore.

Plans, specifications and form of contract may be inspected at the same place, or may be obtained upon the deposit of $5.00 for each set. The right is reserved to reject any or all proposals or to accept the proposal deemed best for the State of Oregon. Prospective bidders should note that the office of the State Highway Commission is in the Capitol Building, Salem, Ore., but that bids are to be received at Poreland, Ore., as stated above. If proposals are mailed, they should be addressed to Salem and forwarded so as to reach there about twenty-four hours prior to the opening of bids.

C. B. McCULLOUGH, Bridge Engineer.

Bids: January 7.

Construction of Electric Lighting

WESTCHESTER COUNTY PARK COMMISSION
CONTRACT NO. 285
Westchester Co., N. Y.

Sealed bids for the construction of the Electric Lighting on the Cross County Parkway in the vicinity of the Boston Post Road and on the Bronx River Parkway in the vicinity of Fenimore Road, located in the Villages of Rye and Scarsdale, Westchester County, N. Y., will be received at the office of the Westchester County Park Commission, 72 West Pondfield Road, Bronxville, N. Y., until 11:30 a.m., January 7th, 1930, when the bids received will be publicly opened and read.

The principal items are:

Rock Excavation	10 cu.yds.
Trenching	2,000 lin.ft.
Transformer Vaults	15 Vaults
One armored Parkway cable in prepared trench or in conduit	4,000 lin.ft.
Light standards equipped complete	11
2" Wrought Iron Conduit under Pavement	50
4" Wrought Iron Conduit in Prepared Trench	80

Pamphlets containing information for bidders, form of proposal, contract drawings and specifications may be obtained by intending bidders at the above address by depositing $5.00 for same.

The right is reserved to reject any or all bids.

WESTCHESTER COUNTY PARK COMMISSION
By JAY DOWNER.
Chief Engineer.

Dated: Bronxville, N. Y.
December 18, 1929.

OFFICIAL PROPOSALS

Bids: January 14.

Locks in New Basin and Bayou St. John

BOARD OF LEVEE COMMISSIONERS, ORLEANS LEVEE DISTRICT, NO. 201 NEW COURT BUILDING,
New Orleans, Louisiana.
November 13th, 1929.

Sealed proposals will be received at the office of the Board of Levee Commissioners of the Orleans Levee District, New Orleans, Louisiana, up to 8 p.m. January 14th, 1930, and then publicly opened for furnishing all labor, material and equipment necessary for the construction of Locks in New Basin Canal South of Robert E. Lee Boulevard and in Bayou St. John, South of Hibernia Avenue.

A Deposit of Ten Thousand Dollars ($10,000.00) in cash, or certified check, or a bid bond in amount of Twenty Thousand Dollars ($20,000.00) by a substantial surety company, licensed to do business in the State of Louisiana, will be required with each proposal. A Surety bond to the amount of 50% of the cost of the contract will be required with notarial contract.

Plans and specifications are on file in the office of the Board of Levee Commissioners of the Orleans Levee District, Suite No. 201 New Court Building, or No. 606 Common Street, New Orleans, Louisiana and will be furnished to prospective bidders upon application.

The right is reserved to reject any or all bids and to waive informalities.

Plans and specifications will be furnished to prospective bidders upon payment of $25.00 (Twenty-five Dollars) cash or certified check, which will not be refunded.

For further information, address W. B. Davey, Acting Chief Engineer.

A. L. SHUSHAN, President.
CHAS. J. DONNER, Secretary.

Bids: January 6.

Bridge

WESTCHESTER COUNTY PARK COMMISSION
CONTRACT NO. 263
New Castle, N. Y.

Sealed bids for the construction of a bridge of reinforced concrete spanning the Putnam Division of the New York Central Railroad located at Echo Lake, south of Millwood Station, Bronx Parkway Extension, Town of New Castle, Westchester County, N. Y., will be received at the office of the Westchester County Park Commission, 72 West Pondfield Road, Bronxville, N. Y., until 11:30 a.m., January 6th, 1929, when the bids received will be publicly opened and read.

The principal items are:

Excavation	2,000 cu.yds.
Fill	3,500 "
Concrete	2,240 "
Masonry	260 "
Portland Cement	3,800 bbls.
Reinforcing Steel	151,000 lbs.
Waterproofing	730 sq.yds.
Metal Railing	11,000 lb.

Pamphlets containing information for bidders, form of proposal, contract drawings and specifications may be obtained by intending bidders at the above address by depositing $5.00 for same.

The right is reserved to reject any or all bids.

WESTCHESTER COUNTY PARK COMMISSION
Dated: Dec. 11, 1929. JAY DOWNER.
Bronxville, N. Y. Chief Engineer.

OFFICIAL PROPOSALS

Bids: January 10, 1930.

Sewer Tunnel

SOUTH YONKERS PROJECT
SECTION B

SEALED BIDS, in opaque envelopes, each addressed to this Commission from Contractors having experience in similar work, will be received up to 2:00 p.m. on Friday, January 10, 1930, at its office, and then publicly opened and read aloud; all bids shall be accompanied under separate cover by a

CERTIFIED CHECK, made payable without condition to this Commission, for $25,000.00; which check or its proceeds is to be returned after execution of the contract with bond for full amounts bid, or retained as liquidated damages in case of failure to duly execute such contract with bond, if awarded; for furnishing all labor, plant and materials for the watertight and enduring

CONSTRUCTION in 160 calendar days of Section B, which comprises about 150 feet of 36-inch cast iron sewer and 2,200 feet of sewer nearly all in 48-inch circular concrete lined tunnel or alternately 36-inch by 60-inch concrete lined tunnel with branch and all connections and appurtenances; principally under Sunnyside Drive, extending from Pier Street to a connection with the existing 4 foot sewer in Valentine Lane, all in Yonkers.

PLANS AND SPECIFICATIONS, Invitation to Contractors, forms for Bids, Contract and Bond may be obtained at the office of this Commission after December 26, 1929, from the Secretary upon the payment of $20.00 per set to be repaid when the same is properly used in bidding, or returned unimpaired within 10 days of the bidding date. Copies will also be sent to the New York office of Engineering News-Record. Preliminary general location plans are now on view at the White Plains office of the Commission.

CONTRACTOR'S BID must fulfill the requirements of the Invitation to Contractors and be made out on the printed and bound forms for Bids as above obtained. The Commission reserves to itself the right to reject any or all bids, or to accept that one of them whose acceptance will, in its judgment, best secure the public interest and efficient work.

WESTCHESTER COUNTY SANITARY SEWER COMMISSION,
EUGENE S. MARTIN, Secretary.
Court House Annex,
White Plains, N. Y.
Telephone 7780.
Dated Dec. 11, 1929.

OFFICIAL PROPOSALS

Bids: December 31.

Heating Work, Oil Burning Equipment

SPEC. NO. 5694

Westchester Co., N. Y.

Sealed proposals covering Heating Work, Oil Burning Equipment, Westchester Police Barracks, Westchester Co., N. Y., in accordance with Specification No. 5694 and accompanying drawing, will be received by the Superintendent, Division of State Police, Executive Dept., 190 State Street, Albany, N. Y., until 3 o'clock p.m. (Eastern Standard Time on Friday, December 13th, 1929. Proposals shall be accompanied by a certified check or money deposit of 5% of the amount of the bid. Successful bidder will be required to give a bond in the sum of 50% of the amount of the contract. Drawings and specifications may be examined free of charge at the following offices:

Commissioner of Architecture, 949 Broadway, New York City.

Commissioner of Architecture, 353 Broadway, Albany, N. Y.

District Engineer, 109 N. Genesee St., Utica, N. Y.

District Engineer, Weighlock Building, Syracuse, N. Y.

District Engineer, Barge Canal Terminal, Rochester, N. Y.

District Engineer, Barge Canal Terminal, Buffalo, N. Y.

District Engineer, 71 Frederick St., Binghamton, N. Y.

Proposal blanks and envelopes may be obtained and drawings and specifications may be purchased by general or subcontractors from the Commissioner of Architecture, 353 Broadway, Albany, N. Y., upon a payment of $2.50.

There will be no return of the money paid for such drawings and specifications.
Dated: November 16, 1929.

OFFICIAL PROPOSALS

Bids: January 15.

Refrigeration Work

SPEC. NO. 5628

Poughkeepsie, N. Y.

Sealed proposals covering Refrigeration Work, Infirmary, Hudson River State Hospital, Poughkeepsie, N. Y., in accordance with Specification No. 5628 and accompanying drawings, will be received by the Commissioner, Department of Mental Hygiene, Capitol, Albany, N. Y., until 3 o'clock p.m. (Eastern Standard Time) on Wednesday, January 15, 1930. Proposals shall be accompanied by a certified check or money deposit of 5% of the amount of the bid. Successful bidder will be required to give a bond in the sum of 50% of the amount of the contract. Drawings and specifications may be examined free of charge at the following offices:

Commissioner of Architecture, 949 Broadway, New York City.

Commissioner of Architecture, 353 Broadway, Albany.

District Engineer, 109 N. Genesee St., Utica, N. Y.

District Engineer, Weighlock Building, Syracuse, N. Y.

District Engineer, Barge Canal Terminal, Rochester, N. Y.

District Engineer, Barge Canal Terminal, Buffalo, N. Y.

Hudson River State Hospital, Poughkeepsie, N. Y.

District Engineer, 71 Frederick St., Binghamton, N. Y.

Proposal blanks and envelopes may be obtained and drawings and specifications may be purchased by general or subcontractors from the Commissioner of Architecture, 353 Broadway, Albany, N. Y., upon a payment of $2.50.

There will be no return of the money paid for such drawings and specifications.
Dated: December 9, 1929.

MAXIMUM COMPETITION IS ASSURED

on your requests for Bids, when they are advertised in the Official Proposal Columns of ENGINEERING NEWS-RECORD.

WRITE FOR THIS BOOKLET—gives full details of our efficient method of construction camp operation. Sent to contractors, engineering firms and railroad officials on request.

Men Forget Their Wanderlust When Served From A Kitchen Like This

Good food and plenty of it prepared by experienced cooks, and served in a clean, cheerful dining room. Good beds to sleep in after a hard day's work. A recreation room, shower baths and other comforts. No wonder men stick to their jobs and labor turnover troubles become just a memory where Central Boarding Camps are maintained.

Such modern camps have become a necessity. Yet they are available at a surprisingly low cost per man per day on a fair contract basis—with immediate cancellation privileges, if the service proves unsatisfactory. To date after furnishing camps on hundreds of jobs for over 20 years, we have yet to experience our first cancellation.

No obligation to furnish estimate—before you make up your bid. Write us today.

CENTRAL BOARDING & SUPPLY CO.

Board of Trade Bldg., 24 South Canal Street, 2 North 9th Street, First Nat'l Bank Bldg.
KANSAS CITY, MO. CHICAGO, ILL. ST. LOUIS, MO. FT. WORTH, TEX.
We also own and operate Central Commissary Co., 1101 Ross Ave., Dallas, Tex.

OFFICIAL PROPOSALS

Bids: January 7.

Concrete Sea Wall

BOARD OF LEVEE COMMISSIONERS
ORLEANS LEVEE DISTRICT,
NO. 201 NEW COURT BUILDING,

New Orleans, Louisiana.
Dec. 6th, 1929.

Sealed proposals will be received at the office of the Board of Levee Commissioners of the Orleans Levee District, at New Orleans, Louisiana, Tuesday, Jan. 7th, 1930, at 8:00 o'clock p.m., and then publicly opened for furnishing all labor, material and equipment necessary for the construction of a concrete sea wall on the shore of Lake Pontchartrain, from West End to the Industrial Canal.

A Deposit of Fifty Thousand Dollars ($50,000.00) in cash, or certified check, or a bid bond in amount of One Hundred Thousand Dollars, ($100,000.00) by a substantial surety company licensed to do business in the State of Louisiana will be required with each proposal. A surety bond to the amount of 50% of the cost of the contract will be required with notarial contract.

Plans and specifications are on file in the office of the Board of Levee Commissioners of the Orleans Levee District either Suite No. 201 New Court Building, or 606 Common St., New Orleans, Louisiana, and will be furnished to prospective bidders upon application.

The right is reserved to reject any or all bids and to waive informalities.

Plans and specifications will be furnished to prospective bidders upon payment, of $100.00 (One Hundred Dollars) which will not be refunded.

No alternate plans, or propositions, other than the one requested by this advertisement will be considered.

For further information, address W. B. Davey, Acting Chief Engineer, or E. C. Hyatt, Engineer in charge of the work.

A. L. SHUSHAN, President.
CHAS. J. DONNER, Secretary.

Bids: January 9.

Paint and Repair Shop Construction

SPEC. NO. 5782

Raybrook, N. Y.

Sealed proposals covering Construction Work for Paint and Repair Shop, New York State Hospital for Treatment of Incipient Pulmonary Tuberculosis, Raybrook, N. Y., in accordance with Specification No. 5782 and accompanying drawings, will be received by the Superintendent, Division of Standards and Purchase, Executive Department, Albany, N. Y., until 3 o'clock p.m. (Eastern Standard Time) Thursday, January 9, 1930. Proposals shall be accompanied by a certified check or money deposit of 5% of the amount of the bid. Successful bidders will be required to give a bond in the sum of 50% of the amount of the contract. Drawings and specificaitions may be examined free of charge at the following offices:

Commissioner of Architecture, 949 Broadway, New York City.

Commissioner of Archecture, 353 Broadway, Albany, N. Y.

District Engineer, 109 N. Genessee St., Utica, N. Y.

District Engineer, Weighlock Building, Syracuse, N. Y.

District Engineer, Barge Canal Terminal, Rochester, N. Y.

District Engineer, Barge Canal Terminal, Buffalo, N. Y.

District Engineer, 71 Frederick St., Binghamton, N. Y.

N. Y. State Hospital for Treatment of Incipient Pulmonary Tuberculosis, Raybrook, N. Y.

Proposal blanks and envelopes may be obtained and drawings and specifications may be purchased by general or subcontractors from the Commissioner of Architecture, 353 Broadway, Albany, N. Y., upon a payment of $2.50.

There will be no return of the money paid for such drawings and specifications.

F. L. MORRIS.

DATED: Dec. 12, 1929.

OFFICIAL PROPOSALS

Bids: January 10.

State Highway Work

STATE DEPARTMENT OF
PUBLIC WORK
DIVISION OF HIGHWAYS

Albany, N. Y.

Sealed proposals will be received by the undersigned at the office, State Public Works Building, 353 Broadway, Albany, N. Y., until one o'clock p.m. on Friday, January 10, 1930, for the construction of highways in the following counties:

	Deposit Required
ESSEX (One Highway: 11.86 miles).	$22,000.00
FRANKLIN (One Highway: 9.56 miles).	$25,000.00
NASSAU (Three Contracts Bridge Protect Slope Protection and Concrete). (2.70 and 1.04 miles).	$6,500.00, $5,000.00 and $1,200.00
STEUBEN (One Highway: 6.45 miles).	$14,000.00
WARREN (One Highway: 5.90 miles).	$12,000.00

Also for the reconstruction of the following:

CAYUGA (Bridge Contract: 0.55 and One Contract: 3.82 miles).	$3,500.00 and $9,000.00
DELAWARE (Bridge Contract: 0.12 mile).	$1,100.00
ERIE (One Contract: 5.98 miles).	$22,000.00
GENESEE (One Contract: 4.70 miles).	$17,000.00
NASSAU (One Contract: 6.61 miles).	$30,000.00
ONEIDA (One Contract: 0.50 mile).	$3,100.00
OTSEGO (One Contract: 3.76 miles).	$11,000.00

Maps, plans, specifications, and estimates may be seen and proposal forms obtained at the office of the Department in Albany, N. Y., and also at the office of the District Engineers in whose division the roads are located. The addresses of the District Engineers and the Counties in which they are in charge will be furnished upon request.

The especial attention of bidders is called to "General Information for Bidders" in the itemized proposal, specifications, and contract agreement.

A. W. BRANDT,
Commissioner of Highways.

BEACON COMMISSARY CORP.

An Instant Source of Man Power

The Beacon Commissary Corporation is prepared to show the constructor that the labor camp will cut his pay roll costs and keep the job moving on schedule time.

If you write us or telephone Bowling Green 0067 transportation facilities will be furnished so that you can inspect our operations and personally check our references.

22 South Street
New York City

OFFICIAL PROPOSALS

Bids: January 9.

Replacement of Stairways

SPEC. NO. 5801

Raybrook, N. Y.

Sealed proposals covering Construction Work for Replacement of Stairways in Irvor and MacDonald Wings, New York State Hospital for Treatment of Incipient Pulmonary Tuberculosis, Raybrook, N. Y., in accordance with Specification No. 5801 and accompanying drawings, will be received by the Superintendent, Division of Standards and Purchase, executive Department, Albany, N. Y., until three o'clock p.m. (Eastern Standard Time) Thursday, January 9, 1930. Proposals shall be accompanied by a certified check or money deposit of 5% of the amount of the bid. Successful bidders will be required to give a bond in the sum of 50% of the amount of the contract. Drawings and specifications may be examined free of charge at the following offices:

Commissioner of Architecture, 949 Broadway, New York City.

Commissioner of Archecture, 353 Broadway, Albany, N. Y.

District Engineer, 109 N. Genessee St., Utica, N. Y.

District Engineer, Weighlock Building, Syracuse, N. Y.

District Engineer, Barge Canal Terminal, Rochester, N. Y.

District Engineer, Barge Canal Terminal, Buffalo, N. Y.

District Engineer, 71 Frederick St., Binghamton, N. Y.

N. Y. State Hospital for Treatment of Incipient Pulmonary Tuberculosis, Raybrook, N. Y.

Proposal blanks and envelopes may be obtained and drawings and specifications may be purchased by general or subcontractors from the Commissioner of Architecture, 353 Broadway, Albany, N. Y., upon a payment of $2.50.

There will be no return of the money paid for such drawings and specifications.

F. L. MORRIS.

DATED: Dec. 12, 1929.

Bids: January 7.

Flood Lighting System

SPEC. NO. 5750

Napanach, N. Y.

Sealed proposals covering Flood Lighting System, Institution for Defective Delinquents, Napanoch, N. Y., in accordance with Specification No. 5750 and accompanying drawing, will be received by the Commissioner, Department of Correction, 11 North Pearl Street, Albany, N. Y., until 3 o'clock p.m. (Eastern Standard Time) on Tuesday, January 7, 1930. Proposals shall be accompanied by a certified check or money deposit of 5% of the amount of the bid. Successful bidder will be required to give a bond in the sum of 50% of the amount of the contract. Drawings and specifications may be examined free of charge at the following offices:

Commissioner of Architecture, 949 Broadway, New York City.

Commissioner of Architecture, 353 Broadway, Albany, N. Y.

District Engineer, 109 N. Genesee St., Utica, N. Y.

District Engineer, Weighlock Building, Syracuse, N. Y.

District Engineer, Barge Canal Terminal, Rochester, N. Y.

District Engineer, Barge Canal Terminal, Buffalo, N. Y.

District Engineer, 71 Frederick St., Binghamton, N. Y.

Institution for Defective Delinquents, Napanoch, N. Y.

Proposal blanks and envelopes may be obtained and drawings and specifications may be purchased by general or subcontractors from the Commissioner of Architecture, 353 Broadway, Albany, N. Y., upon a pavement of $2.50.

There will no return of the money paid for such drawings and specifications.
Dated: November 16, 1929.

U. S. Government

U. S. Department of Agriculture, Bureau of Public Roads, Washington, D. C., December 18, 1929. Sealed bids, subject to the conditions contained herein, will be received until eleven o'clock a.m., January 23, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for Unit II of the Mount Vernon Memorial Highway. Unit II begins on Columbia Island in the Potomac River at a point approximately 1,300 feet south of the center line of the Arlington Memorial Bridge Plaza and extends to the entrance gates of Mount Vernon, being located partly in the District of Columbia, partly in Alexandria, Virginia, and partly in Arlington and Fairfax Counties, Virginia. Unit II consists of the grading, drainage and incidental construction for the highway as detailed hereinafter. Alternate bids will be received for vitrified clay pipe in place of concrete culvert pipe for all of the several sizes listed. No distinction between these kinds will be recognized; the total cost of the alternate selected or, if bids are tendered upon both, the lower total cost will be used in computing the total bid. The award will be upon the basis of one kind only. The right is reserved to let the work as a single contract, including the item "Special Borrow," or to award the item "Special Borrow" as a separate, independent contract to the same or other bidders, as may appear to the best interest of the Government. If the "Special Borrow" is awarded as a separate, independent contract the date of execution of the contract, beginning of work and of completion of the work shall be as hereinafter provided for the entire work but for such independent contract the amount of liquidated damages for failure to complete the work within 400 calendar days will be $50.00 for each calendar day of delay until the work is completed and accepted. In the event the item "Special Borrow" is awarded as a separate, independent contract, the amount of liquidated damages for failure to complete within 400 calendar days, the remainder of the work awarded to contract will be $200.00 for each calendar day of delay until the work is completed and accepted. The bids will be opened in the office of the Chief, Bureau of Public Roads, U. S. Department of Agriculture. Information for bidders, together with questionnaires, may be obtained in the office of the Bureau of Public Roads, Willard Building, Washington, D. C. Completed questionnaires covering experience and financial statement of the contractor must be submitted to the Chief, U. S. Bureau of Public Roads, not later than January 16, 1930. Bids will not be considered from bidders who fail to submit these questionnaires, nor from bidders who fail to establish to the satisfaction of the contracting officer ability, as indicated by the questionnaires, to satisfactorily undertake and complete the work. Bidders must submit with their bids a plan and equipment questionnaire showing in complete detail the proposed manner of handling the contract, the organization of forces, the equipment and equipment layout, camp set-ups and other pertinent information. Failure to submit this questionnaire properly executed will be sufficient grounds for considering the bid irregular. The length of the contract unit to be constructed or improved is approximately 12.441 miles, and the approximate quantities of each item of work are as follows:

Item	Quantity	Description
1	43,240 cu.yds.	Stripping and storing topsoil
2	106 acres	Clearing and grubbing
3		Buildings to be removed as per Schedule "A"
4		Buildings to be removed as per Schedule "B"
5		Buildings to be removed as per Schedule "C"
6		Structure to be removed as per Schedule "D"
7	383,275 cu.yds.	Unclassified excavation
8	5,020 cu.yds.	Unclassified excavation for structures
9	150 cu.yds.	Foundation fill
10	131,570 cu.yds.	Pressure jetting of fills
11	132,365 cu.yds.	Unclassified excavation for borrow
12	2,363,770 sta.yds.	Overhaul
13	12.441 miles	Finishing earth graded road
14	3,700 sq.yds.	8-inch gravel base course
15	1,720 sq.yds.	10-inch gravel base course
16	3,880 sq.yds.	6-inch gravel surface course
17	2,300 sq.yds.	8-inch gravel surface course
18	5,420 sq.yds.	Bituminous macadam surface course
19	1,950 cu.yds.	Class "A" concrete
20	10 cu.yds.	Class "B" concrete
21	10 cu.yds.	Class "D" concrete
22	10 cu.yds.	Class "S" concrete
23	119,900 lbs.	Reinforcing steel
24	90 cu.yds.	Cement rubble masonry
25	400 cu.yds.	Rubble faced concrete masonry
26	50 cu.yds.	Dry rubble masonry
27	1,680 lin.ft.	Concrete pipe—8-inch diameter
28	659 lin.ft.	Concrete pipe—12-inch diameter
29	225 lin.ft.	Concrete pipe—15-inch diameter
30	283 lin.ft.	Concrete pipe—18-inch diameter
31	4,848 lin.ft.	Concrete pipe—24-inch diameter
32	44,200 lin.ft.	Untreated timber piling
33	5,775 lin.ft.	Vitrified tile underdrain
34	600 sq.yds.	Grouted rubble gutter
35	1,500 lin.ft.	Concrete curb
36	860 sq.yds.	Brick walks
37	12 each	Catch basins and drop inlets
38	6 each	Manholes
39	1,480 lin.ft.	Rustic guard rail
40	186,850 cu.yds.	Special borrow

The quantities of the items for the alternate bid involving vitrified pipe will be as set forth above except that in place of Items 27 to 31, inclusive, the following shall be substituted:

Item	Quantity	Description
27A	1,680 lin.ft.	Vitrified pipe—8-inch diameter
28A	659 lin.ft.	Vitrified pipe—12-inch diameter
29A	225 lin.ft.	Vitrified pipe—15-inch diameter
30A	283 lin.ft.	Vitrified pipe—18-inch diameter
31A	4,848 lin.ft.	Vitrified pipe—24-inch diameter

Where copies of plans are furnished bidders a deposit of $50.00 will be required to insure their return. All checks should be made payable to A. Zappone, Disbursing Clerk, U. S. Department of Agriculture. If within 15 days after opening bids, plans are not returned, the deposit will be forfeited to the Government. Guarantee will be required with each bid as follows: In the sum of not less than 20 per cent of the total amount bid for the entire work. If certified check is furnished it should be made payable to A. Zappone, Disbursing Clerk, U. S. Department of Agriculture. Performance bond will be required as follows: In the sum of 100 per cent of the total amount bid for the entire work. Liquidated damages for delay will be the amount of $250.00 for each calendar day of delay until the work is completed and accepted. Partial payments will be made as stipulated in the specifications. Article on patents will be made a part of the contract. Bids must be submitted upon the Standard Government Form of Bid and the successful bidder will be required to execute the Standard Government Form of Contract for Construction. The right is reserved, as the interest of the Government may require, to reject any and all bids, to waive any informality in bids received, and to accept or reject any items of any bid, unless such bid is qualified by specific limitation. Envelopes containing bids must be sealed, marked and addressed as follows:

"Bid for—Unit II Mount Vernon Memorial Highway, Bureau of Public Roads, U. S. Department of Agriculture, Washington, D.C.

"To be opened at 11:00 a.m., January 23, 1930.

"Submitted by .....
(Name of contractor)

Thos. H. MacDonald, Chief of Bureau. (258)

SEALED BIDS, in triplicate, subject to the conditions contained herein, will be received by the U. S. Veterans' Bureau, Room 764, Arlington Building, Washington, D. C., until 11 a.m., January 14, 1930, and then publicly opened for furnishing all labor and materials and performing all work required for *U. S. Veterans' Hospital, Lexington, Kentucky*, for *Construction of Buildings and Utilities*, including roads, walks, and drainage. This work will include excavating, reinforced concrete construction, hollow tile, brickwork, limestone, architectural terra cotta, marble work, floor and wall tile, rubber tile and linoleum floors, iron work, steel flag pole, steel sash, steel stairs with slate treads, metal stall partitions, slate, metal and built-up roofing, roof ventilators, skylights, metal lathing, plastering, sound deadening, carpentry, dumb waiter, platform scales, metal weatherstrips, insect screens, window shades, painting, glazing, hardware, plumbing, heating, boiler plant, incinerator, radial brick chimney, electrical work, electric elevators, refrigerating and ice making plant, steel water tank and outside sewer, water, gas steam and electric distribution systems. *Separate bids* will be received for (a) General Construction (including the plumbing, heating and electrical work and oil burning equipment); (b) Electric Elevators; (c) Refrigerating and Ice Making Plant; (d) Steel Water Tank and Tower, and (e) Radial Brick Chimney, all as set forth on bid form. Bids will be considered only from individuals, firms or corporations possessing satisfactory financial and technical ability, equipment and organization to insure speedy completion of the contract and in making awards, the records of bidders for expedition and satisfactory performance on contracts of similar character and magnitude will be carefully considered. At the discretion of the Director, drawings and specifications may be obtained upon application to the Construction Division, Room 764, Arlington Building, Washington, D. C. Deposit with application of a check or postal money order for $80.00 payable to the TREASURER OF THE UNITED STATES is required as security for safe return of the drawings and specifications within ten days after date of opening bids. FRANK T. HINES, Director, December 10, 1929. (242)

Office Constructing Quartermaster, March Field, Riverside, California. Sealed Proposals in Triplicate will be received here until 11 o'clock, a.m., December 30th, 1929, and then opened, for the Construction of the Set of Field, Officers, Quarters. Copies of Plans and Specifications, may be had on application at this Office, $5.00 deposit on each set of plans will be required for return. (244)

SEALED BIDS, indorsed "Bids for Repairs to Oil House, Specification No. 6055," will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until 11 o'clock a.m., January 2, 1930, and then and there publicly opened, for roof repairs and painting at the Naval Supply Depot, New York (Brooklyn), N. Y. Specification No. 6055 may be obtained on application to the Bureau or to the Commandant, Third Naval District, 641 Washington Street, New York, N. Y. L. E. GREGORY, Chief of Bureau, November 29, 1929. (254)

OFFICIAL PROPOSALS

Bids: January 20.

Oklahoma-Texas, Bridges Over Red River

Identical bids will be filed with both the Oklahoma State Highway Engineer at Oklahoma City and the Texas State Highway Engineer at Austin, Texas, until 10 o'clock a.m., January 20, 1930, for the following bridges over Red River:

On U. S. Highway 77, between Marietta, Oklahoma and Gainesville, Texas, 5-210', 1-120' and 1-80' trusses.

On U. S. Highway 81, between Terrill, Oklahoma and Ringgold, Texas, 13-144' trusses and 1-40' I-beam spans.

Plans are on file in each highway department and proposals may be secured there. Bidders desiring to purchase plans will secure same from the Oklahoma State Highway Department at Oklahoma City.

U. S. Government

U. S. ENGINEER OFFICE, WILMINGTON, DEL.—Sealed bids will be received here until 3 p.m., January 17, 1930, and then publicly opened for furnishing all labor and materials and performing all work for constructing and delivering afloat one 15 tons Derrick boat. Further information on application. (262)

UNITED STATES ENGINEER OFFICE, Room 710, Army Building 39 Whitehall Street, New York, N. Y.—Sealed bids, in duplicate, will be received until 12 m. Jan. 23, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for dredging approximately 49,700 cubic yards of material in East Chester Creek, N. Y. (263)

UNITED STATES ENGINEER OFFICE, Room 710, Army Building, 39 Whitehall Street, New York, N. Y. Sealed bids, in duplicate, will be received until 12:00 M., January 21, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for dredging approximately 218,100 cubic yards, place measurement, of material in Newtown Creek, N. Y., including Maspeth Creek. (264)

U. S. ENGINEER OFFICE, Poland and Dauphine Sts., New Orleans, La.—Sealed bids, in duplicate, will be received until 3 p.m., January 15, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for constructing and delivering afloat one 65 ft. 6 in. steel Diesel driven tugboat. Further information furnished on application. (255)

U. S. Government

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., December 17, 1929.—Sealed bids will be opened in this office at 3 p.m., January 22, 1930, for the construction of a one story and basement U. S. post office, etc., building, approximately 4,900 sq.f., ground area, at Rushville, Ind. Drawings and specifications, not exceeding six sets, may be obtained at this office in the discretion of the supervising architect by a satisfactory general contractor, and provided a deposit is made of $15.00 for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. JAS. A. WETMORE, Acting Supervising Architect. (261)

OFFICE OF CONSTRUCTING QUARTERMASTER, Ft. Riley, Kansas—Sealed proposals will be receive at this office until 10 a.m., January 24, 1930, and then opened, for the construction of sixteen sets of Non-Commissioned Officers' Quarters. Plans and Specifications may be obtained from this office by deposit of $25.00 guarantee. (266)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., December 21, 1929.—Sealed bids will be opened in this office at 3 p.m., January 14, 1930, for remodeling and enlarging the U. S. Post Office and Court House at Athens, Ga. Drawings and specifications may be obtained from the Custodian, U. S. Post Office and Court House, Athens, Ga., or at this office in the discretion of the Supervising Architect. JAS. A. WETMORE, Acting Supervising Architect. (265)

PROPOSALS FOR APARTMENT BUILDINGS.—Office of Constructing Quartermaster, Fort Monroe, Va.—Sealed proposals will be received here until 11 a.m., January 7, 1930, and then opened, for construction of six 4-family brick and tile apartment houses. Further information on application. (233)

U. S. ENGINEER OFFICE, Pittsburgh, Pa.—Sealed bids will be received here until 12 noon (Eastern time), January 13, 1930, and then opened, for furnishing and delivering one hydro-electric plant for Lock No. 7, Allegheny River. Information on application. (253)

U. S. Government

U. S. ENGINEER OFFICE, Charleston, S. C.—Sealed bids in triplicate subject to the conditions contained in specifications will be received until 12 o'clock noon December 30, 1929, and then publicly opened, for furnishing all labor and materials and performing all work for repairing a part of the stone quay of the U. S. Custom House wharf, Charleston, S. C. Information furnished on application. (232)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., December 6, 1929.—Sealed bids will be opened in this office at 3 p.m., January 21, 1930, for the construction (except elevators) of the U. S. immigrant station, assay office, etc., at Seattle, Wash. Drawings and specifications, not exceeding six sets, may be obtained at this office in the discretion of the supervising architect by any satisfactory general contractor, and provided a deposit is made of $50.00 for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. JAS. A. WETMORE, Acting Supervising Architect. (256)

U. S. ENGINEER OFFICE, Pittsburgh, Pa.—Sealed bids will be received here until 12 Noon (Eastern Time), January 2, 1930, and then opened, for furnishing and delivering one upper and one lower lock gate for Lock No. 8, Allegheny River. Information on application. (228)

OFFICE OF CONSTRUCTION QUARTERMASTER, Ft. McPherson, Ga.—Sealed proposals will be received here until 10:00 a.m., January 28, 1930, and then opened for the construction of clinic and ward building, kitchen and mess building, and the construction of passenger elevator and enclosure in main hospital building at Ft. McPherson, Georgia. $25.00 deposit required for plans and specifications. Further information on application. (252)

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APPLICATIONS are being considered from recent graduates of engineering schools to enter employ of structural steel company. Only those need apply who can furnish proper recommendations in regard to their scholastic training, etc. Apply by letter giving full details. Address P-802, Engineering News-Record, 1600 Arch Street, Philadelphia, Pa.

CONSTRUCTION engineer who understands paving, sewer work, retaining walls, subways, caissons, bridge work, all classes of excavation, etc. Must be able to handle and organize men and direct the work. Vicinity of Pittsburgh. State experience, references, age and salary desired. P-805, Engineering News-Record, Tenth Ave. at 36th St., New York.

DETAILERS, designers and checkers wanted on structural steelwork. Only those will be considered who have had experience with structural fabricators. Permanent positions for first class men. Location Philadelphia District. Apply by letter giving age, experience in detail and salary expected. Address P-801, Engineering News-Record, 1600 Arch Street, Philadelphia, Pa.

MECHANICAL engineer wanted, experienced in designing heavy special machines for structural steel fabricating plants. State education and experience. Apply McClintic-Marshall Company, attention Mr. Arch McKinley, P. O. Box 1594, Pittsburgh, Pa.

OPENING for designing engineer experienced in flotation mill roasters and reverberatory furnace work. Good opportunity for the right man. Apply to Tennessee Copper Co., Copperhill, Tenn., giving complete data and references in application.

REINFORCED concrete engineer with sales ability, two to three years bar company or similar experience. Salary $225-$275. Central West territory. P-786, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

WANTED for plant development work, a graduate mining or chemical engineer, who has two or three years' oil refining experience. Cooperative temperament essential. In first letter state age, outline of college work, description of former positions, and the work you are now specializing in, married or single; send photograph. Shell Petroleum Corporation, Sellers, Louisiana.

WANTED structural steel detailers, having 3 to 4 years' experience with commercial fabricators. State your experience in detail, give technical training, age, nationality, salary required and earliest date to report. H. C. Molsberry, Chief Draftsman, Standard Building Engineering Department, Truscon Steel Co., Youngstown, Ohio.

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MENFINDERS require immediately 60 civil engineering graduates with field experience, highway and land development, Africa, $225; irrigation, Latin America, $200; topographical draftsmen, Central America, $175-$225; designing engineers, Asia, $350. For United States, railroad valuation engineers and maintenance engineers, $250; draftsmen, $200; computers, $200; civil graduates, $155; highway draftsmen, $160; plan designers, $200. Write or wire today; sure quick service; pay with acceptance like you buy a railroad ticket; built through 25 years' world-wide service—largest in the West. Interstate Co., Security Bldg., Denver, Colo.

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CIVIL engineer—Two recent college graduates desire positions in possessions or foreign. Field, office and materials experience. At present employed. References. PW-807, Engineering News-Record, 520 N. Michigan Ave., Chicago, Ill.

CIVIL engineer, recent graduate; municipal and highway experience, desires position with advancement. PW-818, Engineering News-Record, Tenth Ave. at 36th St., New York.

FOREIGN service civil engineer, railroads, highways, sewers, river soundings, location, construction, field, office; English, Spanish. Age 33. Salary $250 with expenses, $290 without. Available immediately. Cable Explorator, Oruro, Bolivia, South America.

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ENGINEER, mechanical and electrical. Power house and industrial plant designer, heat balance calculations, heating, ventilating, substation & electric distribution; wide experience. PW-789, Engineering News-Record, Tenth Ave. at 36th St. New York.

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INSTRUMENTMAN or bridge inspector engineer. Capable of doing field and office work for bridge contractor. Three years' experience. Age 24, married. Technical education. F. S. Hoggatt, Fountain City, Indiana.

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CONSTRUCTION superintendent, 20 years' practical experience, subways, grade crossing eliminations, concrete arch bridges, difficult foundations, cofferdams, caissons, pile driving, harbor improvements, heavy shoring, underpinning, tunnels, water purification and sewage disposal plants, $400 per month; location immaterial. PW-538, Engineering News-Record, Tenth Ave. at 36th St., New York.

CONSTRUCTION superintendent, many years in charge of heavy excavation transportation placement; also plain and reinforced concrete. PW-797, Engineering News-Record, Tenth Ave. at 36th Street, New York.

CONSTRUCTION superintendent or engineer, municipal work. Land and topographical surveys. Real estate development, plan and division calculations. Grade plans. Estimates, paving, sewers, etc. PW-804, Engineering News-Record, Tenth Ave. at 36th St. New York.

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DREDGE manager-superintendent. Twenty years' responsible charge dredging projects. River, harbor and canal excavations, deep waterways, ship channels, fills, rock removal, land reclamation, drainage. Highest reference. PW-812, Engineering News-Record, Tenth Ave. at 36th St. New York.

RAILROAD construction superintendent or assistant to go abroad. Experience in India, Africa, Egypt, etc. Used to handling large forces of coolie labor on roadway, bridges, tracks. PW-743, Engineering News-Record, 520 N. Michigan Ave., Chicago, Ill.

Miscellaneous

CONSTRUCTION foreman, engineering ability; age 40; 15 years' experience conduits, watermains, sewers, roads, excavations, foundations, tunnels. Capable and dependable. Just off a long job. Can handle large force. PW-823, Engineering News-Record, Tenth Ave. at 36th St., New York.

ENGINEER, ten years practical experience desires temporary position until April 1st. $350 per month. Experienced in handling men, estimating, purchasing, plant layout and surveys. PW-803, Engineering New-Record, Tenth Ave. at 36th St., New York.

MASTER mechanic, 18 years' experience in all kinds of contractor equipment, subway, bridge, state road and building. Can also operate all kinds of hoisting machinery. Go anywhere. PW-766, Engineering News-Record, Tenth Ave. at 36th St., New York.

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SALES engineer or construction engineer now employed New York State. Three years selling asphalt, desires change. Twelve years' construction experience, 5 years' as salesman engineer. Age twenty-nine years. Any other state considered. Can leave on short notice. SA-808, Engineering News-Record, Tenth Ave. at 36th St. New York.

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M-820, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

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Mechanical engineering knowledge preferred. To sell in New York and vicinity, locomotives—steam, gasoline, gas-electric driven—and other industrial equipment. Please give references, experience and salary expected. SW-821, Engineering News-Record, Tenth Ave. at 36th St., New York.

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G-7

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1—8¼x10-in. Three Drum **Lidgerwood** with Boiler.
1—**Flory** single drum, reversing, swinging **Engine.**
1—Van-Wie **Centrifugal Pump** direct connected to 6x6-in. **Vertical Engine.**
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Steam Air Compressor and **Air Tank.**
3—**Sets of Pile Driving Leads,** 70, 75 and 78 ft. high. Now located at Elizabeth City, N. C.

All to be sold at a very low price. Make me an offer on the whole plant where it is.

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2—3000 K.V.A., O.I.S.C. Outdoor Type Transformers, General Electric Company, Type H.T., Form DD, 3 ph., 60 cy., 13200/-2300/4000, 4-2½% F.C. taps below 13200 v., 5.5 reactance. Located near Boston. Excellent condition.

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One heavy duty Koehring Crane, Serial No. C 259, 45-ft. boom. This crane is now being rebuilt from the ground up, in our yard, and all worn parts have been replaced. A factory inspector called here, went over this machine and picked out the parts that were necessary, and it is being rebuilt according to his recommendations. It will be offered for sale when completed possibly by January 15th as an absolutely A-1 rebuilt crane.

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BOX CAR LOADER

1—Ottumwa Portable, Pusher Type, powered with a 75 hp., 220 volt, 3 phase, 60 cycle A.C. Motor, 575 r.p.m.

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4—**Easton Phoenix,** 8-yd. st. ga. **Pit Cars.**
1—12-in. **Layne Multi-stage Turbine Deep Well Pump** with No. 75 L.K.M.U. Electric Head.
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1—Std. Ga., 60-Ton, 16-in.x24-in., 2-wheel **Davenport Switcher Type Locomotive,** Shop No. 915.

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1—599 cu.ft. Ingersoll-Rand with 104 H.P., 3 ph., 60 cy., 220/440 V. G.E. Slip Ring motor.
2—310 cu.ft. Ing.-Rand Gas Port. rubber tires.
2—1030 cu.ft. Ingersoll-Rand Motor Driven, Synchronous Motor Drive.

AIR TOOLS

Boyer 60-80 Hammers—Thor Close Quarter Drills No. 8 and No. 9. Chicago Pneumatic No. 1 and No. 2 Drills.

CARS

40—5-yd. Koppel 36-in. ga. st'l un'frame dump.
12—12-yd. Western Standard Gauge Vertical Cylinder Air Dumps, 19-ft. Beds.
10—20-yd. Western Standard Gauge Dumps.

CRANES—GANTRY

2—15-ton Link Belt Gantry Cranes, full revolv. with 90-ft. bm., mtd. on 30-ft. towers stm. op.

DERRICKS—COMPLETE

1—5-ton Insley Steel Guy Derrick, 95-ft. Mast, 85-ft. Boom, 12-ft. Bullwheel, bucket operating.
1—5-ton all steel 50-ft. boom, 42-ft. 8-in. mast, stiffleg, fittings.

GASOLINE SHOVELS AND CRANES

1—⅝-yd. Byers Cat. Shovel. Used 90 days.
1—1 cu.yd. Link-Belt Shovel. Rebuilt.
1—1 cu.yd. Complete Shovel Front for Link-Belt Model K-2.
1—¾-yd. Shovel Front for Mod. 206 P&H. Comp.
1—Model 21 Marion ¾ yd. Caterpillar Gasoline Electric Shovel.
1—15-ton Link-Belt Crawler Crane, 50-ft. boom.
1—15-ton Byers Crawler Crane, 50-ft. boom.
1—No. 2 Hoar Air Tunnel Shovel, 6 cu.ft., 36-in. ga.

1324 Widener Bldg.,

SPECIAL

DERRICK BOAT

Complete machinery for 50-ton Derrick Boat, including steel A-frame, 100-ft. steel boom, 3-drum 12x14 Lidgerwood Hoists, Boiler, Tanks, etc.

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10—5-in. Suction, 4-in. Discharge Submersible Motor Driven Pumps, motors, 3-phase, 60 cycle, 220 volts. Capacity, 435 GPM at 75-ft. head or 690 GPM free discharge. Complete and brand new.

HOISTING ENGINES

1—75 HP. National Triple Drum Independent Motor Driven swingers and bank lever controls, 3 phase, 60 cy., 440 volts.
1—60-hp. National 3-drum with Independent swinger 3 ph., 60 cy., 220 v.
2—8½x10 Triple Drum Lidgerwood A.S.M.E. boiler, with or without boiler.
1—7x10 Lidgerwood DC, DD, with swinger attached. Boiler mounted.
1—7x10 Lidgerwood, 3-drum, swinger attached. A.S.M.E. Boiler.
1—Schramm Single Drum Gasoline Hoist, 1000 lb. line pull.
1—4x5 American Swinging Engine. S. D. Reverse Throttle.

B.M.WEISS

Phone: Rittenhouse 2311

KEYSTONE GRADER

1—No. 4 Cat. Gas, Keystone Grader equipped with skimmer and ditcher attachments, ⅝-yd. and 9/10-yd. dippers.

LOCOMOTIVES

1—6-ton Whitcomb, 24-in. Gauge. Gasoline.
2—14-ton Plymouth, 36-in. gauge Gasoline.
1—25-ton Baldwin Standard Ga. Gasoline. Has seen about 4 months' actual service.
5—11x16 Vulcan 36-in. ga. Sad. Tank, rebuilt.
2—17x24 Porter Type 0-4-0 Standard Gauge Saddle Tank, new 1917. ASME boiler. Excellent condition. Will quote either as oil burners or as with coal burning equipment.
1—20-ton Shay Geared 36-in. Gauge. 175 lbs. steam pressure.
2—40-ton Vulcan Std. Ga. Saddle Tank, A.S.M.E. Boilers.

ROLLER

1—5-ton Good Roads, Jr., 5 wheel. Gas.

LOCOMOTIVE CRANES

1—25-ton Industrial Double Drum, 8-wheel, standard gauge; 65-ft. boom. Like new.
1—35-ton Browning 8-wheel standard gauge, double drum, 60-ft. boom.

STEAM PILE HAMMERS

1—No. 1 McKiernan-Terry.
1—No. 7 McKiernan Terry.
1—Set 62-ft. Steel Pile Driver Leads.

STEAM SHOVELS

1—¾-yd. Marion 21 Traction Mounted Steam Shovel, High Lift.
1—2-yd. Model 37 Marion Caterpillar Steam Shovel, new late 1927, 15 months' service. Wonderful condition.
1—2½-yd. Bucyrus Railroad Type Shovel.

Philadelphia, Pa.

REBUILT EQUIPMENT FROM OUR 3 PLANTS, CONOWINGO AND STARVED ROCK DAM

FOR SALE OR RENT

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2—Blaw-Knox Batcher Plants with 250-ton steel bins, each with No. 56 sand inundator and No. 500 volume stone batcher and cement Weighing device.
4—Same as above with steel bottom for wood bins.
2—Blaw-Knox 116-ton All Steel Bins, one with sand and stone batchers for ¾ or 1-yd. mixer, one with stone batcher and No. 28 inundator for 1-yd. mixer.
1—Blaw-Knox 110-ton All Steel Bin with stone batcher and No. 28 inundator for 1-yd. mixer.
1—Blaw-Knox 65-ton Bin with stone and sand batchers for 28-S mixer.
2—Johnson 46-yd. Bins with stone and sand batchers for 21-S and 14-S mixer.
1—Blaw-Knox 35-ton Bin No. 14 inundator and with batchers for ½ or ¾ yd. mixer.

BOILERS

56—Boilers from 30 to 150 hp., Marine, Locomotive and Vertical.

BUCKETS

69—Clam Shell Orange Peel and Dragline Buckets, sizes 1½-yd. to ½-yd.

CARS

9—Standard Gauge Flat Cars. Cap. 60,000 to 100,000 Full M.C.B., all with air brakes, lengths 36 ft. to 40 ft.
8—Easton Standard Gauge Flat Cars, capacity 6 tons; platform 10 ft. long x 6 ft. wide.
8—Easton 24-in. gauge, 3-ton capacity, platform 5-ft. long x 3-ft. 6-in. wide.
70—Koppel, 36-in. gauge, 5-yd., 2-way dump cars.

CONCRETE MIXERS

2—Size 56-S Mixers, with batch hopper with or without power. 1—Smith tilter, 1—Ransome.
1—Smith 40-S Tilter, with or without electric motor.
2—32-E Koehring Mixers with boom, bucket and 4-cyl. gasoline engine, mounted on 30-ton capacity ½ crawler trailer.
108—Concrete Mixers, sizes 56-S, cap. ¾ yd.; 28-S cap. 1 yd.; 21-S, cap. ¾ yd.; 14-S, cap. ½ yd. With steam or electric power with side loaders or batch hoppers. Following makes: Marsh-Capron, Koehring, Milwaukee, Ransome, Smith, Smith-Chicago, Lakewood, Foote or Oshkosh.
12—10S with side loaders and water tanks
LeRoi Gasoline Engines.
46—7-S, cap. 1 bag with low charging platforms, with gasoline engines.

CONCRETE PLANTS

6—Ransome Concrete Tower Outfits, each consisting of 2-yd. tower bucket, 80 cu.ft. hoppers, straight and sloping back with sliding frames, booms, boom chutes and counterweight chutes.
Large quantity of straight line chutes. Lengths from 18 ft. to 10 ft., trussed and plain; also large lot of flexible drop chutes.

CONVEYORS AND ELEVATORS

2—Link-Belt Bucket Elevators, 82-ft. centers; with 12x7-in. buckets, mounted on chain.
1—Belt Conveyor, 24-in. wide by 120-ft. centers.
1—Portable Belt Conveyor, 16-in. wide by 30-ft. centers, with 3½ hp. Hercules gasoline eng.

CRANES

1—Austin Wolverine, 12-ton capacity, with 50-ft. boom on full crawlers, gasoline operated.
1—Link-Belt gasoline, Model K-1, 10-ton, on full crawlers, with 50-ft. boom, shop No. K-1024.
1—Northwest, Model 104, with 40-ft. boom, mounted on full crawlers, shop No. 2223.
1—Brownhoist No. 1 7-ton capacity, with 35-ft. boom, full crawlers, gasoline.
1—Austin No. 5, gasoline, with 36-ft. boom, on full crawlers.
2—Byers Bear Cat on crawlers, with 30-ft. boom.
1—Byers, Model 10, steam on half crawlers, with 30-ft. boom.
2—Type "B" Erie crane or dragline, with 40-ft. boom and ¾-yd. bucket, also with steam shovel boom and ¾-yd. dipper. Shops Nos. 3900 and Nos. 3047.
1—Industrial Brownhoist, type C. C. gasoline on crawlers, combination crane and shovel, ½-yd. dipper, 36-ft. boom.

STARVED ROCK DAM EQUIPMENT

(LOCATED AT OTTAWA, ILL.)

BINS AND BATCHERS

2—Blaw-Knox, 35-ton, all steel bin, with stone batchers, and with No. 14 inundator.
1—Extra No. 14 inundator for wood bin.
1—1,000-lb. Blaw-Knox cement weighing batcher.
1—Heltzel sand and stone batcher, capacity 30 to 40 cu.ft.

CARS

15—Continental 36-in. gauge, 5-yd. capacity, 2-way dump cars.
22—Koppel, 36-in. gauge, double trucks, flat cars, capacity 6-ton, with body 15-ft. 6-in. long by 4-ft. 4-in. wide.
12—Lakewood, 2-yd., 36-in. gauge, radial gate, concrete cars.
1—Standard gauge push car.
2—36-in. gauge push cars.

COMPRESSORS

1—Gardner, 2-stage, belt-driven compressor, Size, 15x9x10, capacity 580 cu.ft. per minute. Shop No. 51068, belt connected to 1—Climax, 150 H.P., 6-cylinder, type RCU, gasoline power unit, with air receiver, and 12-in. endless belt and line oiler.
1—Sullivan, 220 ft., Class WK-314, size 5½x5 portable, on trucks, direct connected to 4-cylinder Buda gasoline engine.

CONVEYORS AND ELEVATORS

1—Northern special conveyor for handling concrete, 24-in. wide by 80-ft. centers.
1—Barber-Greene, 24-in. belt x 70-ft. centers, with steel frame, style and No. 97801.
1—Northern portable, 24-in. belt by 36-ft. centers, with 4-cylinder LeRoi, 15 H.P. gasoline engine.
1—Chicago Automatic drag conveyor, portable, 24-in. wide x 20-ft. centers, with Witte gasoline engine.
1—Link-Belt cement bucket elevator No. 30, with boot, bucket, shaft, etc., for 50-ft. centers, No. W-7084.

CRANES

1—Brownhoist locomotive crane, 15-ton, standard gauge, 8-wheel MCB, 50-ft. boom. Shop No. 9392.
1—Northwest 104, on crawlers, with 45-ft. boom and equipped with fair leads. Shop No. 1061.
2—Brownhoist No. 2 gasoline cranes, mounted on full crawlers, 10-ton capacity, with 40-ft. boom and with Climax, 4-cylinder, Model TU, gasoline engine. Shop No. 9961 and No. 9859.

LOCOMOTIVES

5—Plymouth, 8-ton, 36-in. gauge, type 6-DL, with 4-cylinder Climax, Model TU, gasoline engine. Shop No. 2079, No. 2080, No. 2081, No. 2666, and No. 2668.

PUMPS

1—American 8-in. Centrifugal pump; capacity, 1,500 gallons per minute at 35-ft. head; direct connected to 4-cylinder Wisconsin gasoline engine.
1—American, 6-in. suction, 4-in. discharge, 2-stage Centrifugal pump; capacity, 1,000 GPM at 200-ft. head, direct connected to Sterling 225 H.P., 6-cylinder gasoline engine.
1—Gould, 6-in., fig. 3,600, centrifugal pump; on trucks, with 4-cylinder LeRoi, 15 H.P. gasoline engine.
1—Fairbanks-Morse, 4-in., Centrifugal pump; belt driven.
1—Kansas City Haypress, 4-in. Centrifugal dredging pump, belt driven.
1—American, 2-in. Centrifugal, belt driven.
2—Domestic Triplex force pumps, with 15 H.P., 4-cylinder LeRoi gasoline engine on trucks.
3—Fairbanks-Morse, 3x5 typhoon gasoline force pumps, Model T, with 2 H.P., Fairbanks-Morse, type Z, gasoline engine, mounted on trucks. Shop No. T-34598, No. 38772, and No. 39065.
5—Novo, 4-in., diaphragm pump, with 2 H.P. Novo gasoline engine on trucks.

CRANES (Locomotive)

1—Ohio, 30-ton, standard gauge, 50-ft. boom; Shop No. 3367.
1—Ohio, 25-ton, standard gauge, 8-wheel, with 50-ft. or 60-ft. boom; Shop No. 1780.
2—Browning No. 8, 25-ton, with 50-ft. booms, 8-wheel MCB; Shop numbers 2143 and 2026.
1—Browning, No. 2, 15-ton, 4-wheel standard gauge with 50-ft. boom; Shop No. 941. BARGAIN.

DERRICKS

1—American, 20-ton, all steel stiff leg derrick, with 100-ft. boom, 20-ft. bull wheel, arranged for bucket operation and hook work, capacity 20 tons at 100-ft. radius, or 30-ton at 40-ft. radius.
50—American wooden stiff leg derricks, some with 16-in. fittings, and with 80-ft. booms and 16-ft. bull wheels, some with 14-in. fittings with 50 to 70-ft. booms, and 12-ft. bull wheels, arranged for hook work or clam shell.
1—Dobbie, 5-ton stiff leg with 45-ft. boom; 20-ft. mast; legs and sills in proportion.
1—Dobbie, 5-ton, all steel guy derrick, with 70-ft. mast and 62-ft. boom.

HOISTS (Electric)

1—Lambert, three-drum electric hoist, with 100 H.P., 220 or 440 volt, 60 cycle, 3 ph. A.C. motor, with Independent electric swinger, with 15 H.P. motor.
2—American, double drum hoists with attached swinging gear; 1—with 40 H.P. 1—with 37 H.P. Otis, 220 volt, 60 cycle, 3 phase A.C. motor, with levers banked in quadrant.
1—Double Drum Lidgerwood Hoist with attached swinging gear, with 37 H.P., 220 volt 60 cycle, 3 phase, A.C. motor.
6—National double drum electric hoists; drums 16-in. dia. x 29-in. long; 2—with 75 H.P.; 2—with 60 H.P.; 220 volt, 60 cycle, 3 phase A.C. motors. 2—with 50 H.P., 220 volt D.C. series wound motors.
5—Lidgerwood double drum; 3—with 60 H.P. A.C. motors; 2—with 65 H.P., 230 volt D.C. motors.
2—American, single drum, with 60 H.P. A.C., 220 or 440 volt A. C. motors.
1—Lidgerwood, single drum, high-speed builders' hoist, with 52 H.P. A.C. motor.

HOISTS (Steam)

12—Three-drum steam hoists. At present all are equipped with boilers, but could be furnished with or without boilers. 1—9x12 National; 3—9x10 Clyde; 1—8¾x10 Clyde; 1—8¾ x 10 National; 1—7x10 Lidgerwood with attached swinging gear; 2—7x10 Americans.
55—Double drum and single drum steam hoists; cys. all makes and all sizes from cys. 10x12 down to 4¾x6.

LOCOMOTIVES (Gas)

4—Plymouth 14-ton, 35-in gauge; 3—Vulcan, 8-ton standard gauge; 2—Plymouth, 7-ton, 24-in. ga. gear drive, 1—Plymouth, 7-ton, 24-in. ga. friction drive; 1—Milwaukee, 7-ton, 24-in. ga. gear drive; 1—Whitcomb, 3½-ton, 24-in. ga. gear drive.

LOCOMOTIVES (Steam)

1—Davenport, 25-ton, cylinders 12x16, standard gauge, 4-wheel, saddle tank, with air brakes. Shop No. 2076.
1—Porter, 24-ton, cylinders 12x16, standard gauge, saddle tank, 4-wheel, with steam brakes. Shop No. 5093.
1—Vulcan, 21-ton, cylinders 11x16, standard gauge, 4-wheel, saddle tank, air brakes. Shop No. 3580.
2—Vulcan, 20-ton, cylinders 11x16, standard gauge, 4-wheel, saddle tank, steam brakes. Shop No. 1417 and No. 2159.

SHOVELS (Steam)

1—Type 37 Marion full revolving steam shovel, on crawlers, 1¾-yd. dipper, shop No. 5208.
1—Marion, Model 60, railroad type, with 2½ cu.yd. dipper, 25-ft. boom and 16-ft. dipper stick. Shop No. 2225.
2—Erie, type B, shovels, with ¾-yd. dippers and equipped with 40-ft. crane boom, ¾-yd. clamshell bucket. Shop No. 3900 and No. 3047.
1—Marion, Model 21, steam shovel, on crawlers, ¾-yd. dipper. Shop No. 4196.

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TRUCK CRANES
3—Universal Truck Cranes on Mack Trucks.
1—Orton Truck Crane, 7½-ton Mack Truck.

CRANES AND SHOVELS
1—Marion 32 Steam Shovel, 1¼-yd. Rock Dipper, Caterpillar mounted.
7—Northwest 105 Gas Crawler Cranes.
2—Osgood 1-yd. H.D. Gas Crawler Cranes.
1—General ½-yd. Gas Crawler Crane.
2—Ind. 15-ton, 8-wh. Loco. St. Cranes, 45-ft. bms.
1—Browning 8-wh., 25-ton Loco. Crane, 48-ft. bm.
1—Osgood 1¼-yd. Heavy Duty Steam Shovel.

CARS AND LOCOMOTIVES
12—4-yd., 36-in. ga. H.D. St. Underfr. Dp. Cars.
10—5-yd., 36-in. ga. H.D. St. Underfr. Dp. Cars.
17—2-yd., 36-in. ga. V-shape Koppel Cars.
50—10-ton, 36-in. ga. Flat Cars.
1—5-ton, 36-in. ga. Plymouth Gas Locomotive.
6—4½-ton 36-in. ga. Vulcan Gas Locomotives.
2—8-ton standard gauge Whitcomb Gas Locos.
2—6-ton, 24-in. gauge Whitcomb Gas Locos.
1—8-ton Vulcan 36-in. gauge Gas Locomotive.

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7500 ft. 36-in. ga., 25-lb. Lakewood Industrial Track, with switches, curves, bolted clips.
200 tons 45-lb. Relay Rail, used one job only.

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1—1½-ton Tandem Subgrade Gas Roller.
3—3-ton Tandem Gas Roller.

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1—15-ton Terry Wooden Stiffleg, 80-ft. round boom; bullwheel.
2—75-hp., 3 drum Clyde Electric Hoists, geared swingers, 3 phase, 60 cycle, 220 volt.

—SPECIAL—
4—3-ton Tandem Gasoline Rollers.
1—220-ft. Ingersoll-Rand type 20 Portable Compressor, Rubber tires.
1—Type N-O- Cement Gun Unit Complete.
2—35-hp. Clyde D. D. Gas Hoists Waukesha Motors, heavy duty type.
1—Barber-Greene Model 42 Loader.
1—Parsons Model 20 Backfiller.
1—No. 400 Vulcan Pile Extractor.
1—No. 6 McKiernan Terry Pile Hmr.
5—No. 8 Union Sheetiug Hammers.
4—No. 1 McKiernan Terry Sheeting Hammers.
1—Dake Swinging Gear.
1—National Counter Balance Drum.

1—15-ton Terry Steel Stiffleg, 90-100-ft. boom.
1—Amer. 42 hp., 2 drum, 3 ph., 60 cy., 220 v.
1—Lidgerwood 80-hp., 2-dr., 3 ph., 60 cy., 220 v.
1—Ersted 3 speed, 30-hp. Gas, 2 drum.
1—50-hp. Steam 10x12 d.e. d.d. Flory three drum Tandem Skeleton Hoist.

CONCRETE MIXERS
1—10 S Koehring with side loader and water tank, wheel mounted.
1—1-yd. Rex Chain Belt Electric, 3 ph., 60 cy., 220 v., on skids with batch hopper.
1—56 S Ransome A.C. Motor.

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3—110-ft. Ingersoll-Rand Gas Portables.
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2—220-ft. Ingersoll-Rand type 20 Gas Portables.
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1—350-ft. C.P. A.C. or D.C. Motor Drive.
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1—6-in. Lawrence Cent. 4 cylinder gas engine.
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3—8-in. Vertical Cent., 3 ph., 60 cy., 220 v.
2—6-in. Lawrence Electric Driven Pumps.
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2—1-yd. Blaw-Knox Digging Buckets with teeth.
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1—No. 0 Vulcan Hammer.
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1—15-ton cap. Link-Belt, Gasoline Crawler; new 1928, 45-ft. boom, bucket operating, only used three months; perfect condition.

1—25-ton, 8-wheel, Brown Hoist, Steam Locomotive Crane; new 1927; Natl. Board Boiler, 50-ft. boom, bucket operating, M.C.B. trucks; like new.

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1—Lorain 75, Gasoline Crawler; new 1928, **Center Drive,** Waukesha Motor completely rebuilt; 1¼-yd., High Lift, overhauled; like new.

1—41-B Bucyrus-Erie, Steam Crawler; new 1929, 1¼-yd.; used four months; like new.

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2—Gasoline Caterpillar Moore Speedcranes, 45 and 50 ft. boom, 100 hp. motor, self starter. Less than 1 year old. Factory guarantee.
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1—Byers Bearcat, Crane Boom, Hoe Attachment and Skimmer Scoop.
1—1 cu.yd. Thew Steam Caterpillar Shovel.

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1—Bucyrus-Erie 1¼-yd. **Steam Shovel,** mounted on caterpillars, Shop No. near 10,000.
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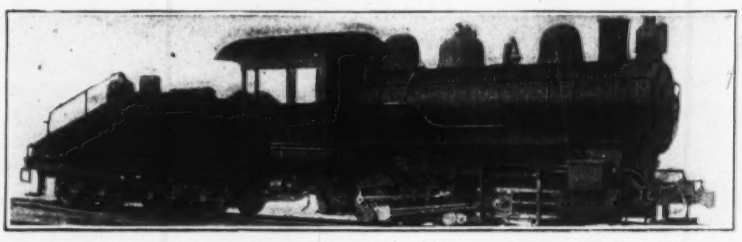

3—78-ton Baldwin, 19x26 in., 6-Driver Switchers, 44 in. wheel centers, 11 ft. 0 in. wheel base, 175 lbs. steam working pressure, tractive power 28,000 lbs., straight and automatic air brakes, cross compound pump, Walschaert outside valve gear, electric headlights front and rear, air bell ringer, air sanders, flexible staybolts, steel cab, steel running boards, steel bumper sills, steel driving boxes, steel wheel centers; built 1913; comply all I. C. C. requirements.

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1—Std. ga. 13x20 Baldwin, 4-wheeled Saddle Tank, A.S.M.E. Boiler, wt. 28 tons, Shop No. 53992.
1—Std. ga. 11x16 Davenport, wt. 21½ tons, A. S. M. E. Nat'l. Bd. Boiler, Shop No. 2155, new.
4—Std. ga. 11x16 Davenports, 4 wheeled saddle tank. Shop Nos. 1939, 2121, 2123 and 2154 A.S.M.E. boilers, wt. 21½ tons.
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1—9x14, 36-in. ga. Porter, 4-wheeled Saddle Tank, Code Boiler, wt. 15 tons. Shop No. 6958.
1—10x16 Cylinder, 36-in. Ga. Davenport, 4-wheeled saddle tank, Shop No. 1918. Wt. 19½ tons. A.S.M.E. Boiler.
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1—36-in. ga., 7x12 Davenport, weight 9 tons, A.S.M.E. boiler, Shop No. 1567.

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3—50-B Bucyrus Shop Nos. 3972, 4003, 4949, steel cats., std. boom equip., A.S.M.E. boiler.
2—Model 37 Marion, steam operated, Shop Nos. 4782 and 5551, st'l cats., std. equip., 1¾-yd. dipper. Code boiler.
2—20-B Bucyrus, Shop Nos. 3748 and 4137, ¾ yd. capacity, steel caterpillars.
2—Type "B" Erie Full-Revolving Caterpillar Shovels with High-Lift Booms, ¾-yd. dippers. Nos. 1989 and 2703.

SHOVEL PARTS

1—Shovel Front comp. for 104 Northwest.
1—Pull-Sh'v'l Attach. comp. for 104 No.W.
3—Complete Shovel Attachments for K-2 Link-Belt, 1-yd. dipper.
Parts for Type B Erie. 1—1-yd. Erie Dip. Shovel boom, dipper arm and 1-yd. dipper for No. 2 Koehring.
1—Pr. Dipper Sticks, 206 P & H.

SPECIALS

DRAGLINE

1—225 Bucyrus, steam operated, equipped 143-ft. boom, 6-yd. Page bucket. Truck mounting.
1—5-ton Holt Tractor-bulldozer.

LOCOMOTIVE CRANES

1—Dock Crane, bucket operating, 50-ft. boom, 7-ft. 10-in. gauge, 12-ft. wheelbase, capacity 15 tons at 18-ft. radius.
1—Type "CD" 20-ton Ohio Eight-wheeled Crane, Shop No. 3660, MCB Trucks, 50-ft. boom, bucket-operating, Code Boiler.

STEAM SHOVELS—Railroad

1—Model 80 Marion, No. 1312, 4-yd. Dipper.
1—60-C Bucyrus, No. 1388, 2½-yd. dipper.

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4—30-yd. Clark all-steel, drop door, automatic air dump cars.
42—20-yd. Western Automatic
20—20-yd. Magor all-steel Automatic Air.
1—18-yd. Western, all steel.
62—16-yd. Western, steel sills, wood bed.
35—12-yd. Western
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4—8-yd. Std. ga. K.&J. St'l Beam, w'd b'd.
17—6-yd. K.&J. steel sills Truss-rod doors.
1—5-yd. 36-in. ga. Continental Wood Bed, Steel Sills.
34—4-yd. 36-in. ga. Western Steel beam.
13—4-yd. K. & J. 36-in. ga. wood sills.

BUCKETS

¾ to 3½ cu.yd. cap. Clamsh. and Dragline.

DRAGLINE EXCAVATORS

1—225 B Bucyrus steam (code boiler) Shop No. 3527, mounting 4—4 wheel truck, 143 ft. boom, 6-yd. bucket.
2—50-B Bucyrus, Shop Nos. 3972 and 4949, steel caterpillars, 50-ft. boom, fairlead, 1½-yd. Page bucket.
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1—Model 220 Page, No. 110, 72-ft. boom, 3½-yd. Page bucket, 100 hp. Charter Oil Eng. mounted on tandem trucks.
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1—Class 14 Bucyrus, Shop No. 2140, 60-ft. boom, 2-yd. bucket, A.S.M.E. boiler, armored caterpillars.

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1—Model 210 P. & H. Dragline, Shop No. 1077, 40 or 50-ft. boom, 1-yd. dragline bucket, armored caterpillars.

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2—Std. ga. Jordan all-steel, Shop Nos. 489 and 1007, air operated.
2—Std. ga. Western, Shop Nos. 605 and 1003.

MISCELLANEOUS

1—5-ton Holt Tractor with Bulldozer.
1—No. 55 Buhl Portable Air Compressor
17—1½-yd. Western, Stretch and Stroud Dump Wagons.
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1-hp. Crawler Gasoline Grader.
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1—Thew 1-yd. Crawler type Steam Shovel, new 1925.

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1—6½-ton Universal Truck Crane equipped with Christy Crawler. This outfit was purchased new April, 1928.

BUCKETS

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1—½-yd. Blaw-Knox.
1—⅝-yd. new McMyler Digging Bucket.
1—1¼-yd. Brownhoist Clam Shell Bucket, practically new.

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1—No. 206 P. & H. Crane, 40-ft. Boom.
1—K-2 Comb. Link-Belt Crawler Crane, 40-ft. boom and 1½-yd. shovel.
1—K-1 Link-Belt Crawler, 40-ft. boom and new Back Hoe.

GAS SHOVEL

1—K-2 Link-Belt Crawler, with 1¼-yd. Dipper.
1—Mead-Morrison ½-yd. Comb. Shovel, 35-ft. clamshell boom, new 1929.
1—No. 206 P. & H. ⅝-yd. Shovel.
1—¾-yd. Trench Hoe Attachment—Link-Belt.
1—Link-Belt S. B. Shovel B'm (new style).

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2—10x8 Ingersoll-Rand Portable Air Compressor, new 1928.
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1190 ft. Ingersoll XB-2.
888 ft. Ingersoll XB-2 and Motor.
709 ft. Sullivan WJ-3 Angle and Motor.
599 ft. Ingersoll XB-2 and Motor.
446 ft. Ingersoll XB-2.

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4384 ft. Ingersoll ORC-3.
2588 ft. Ingersoll OC-3.
1955 ft. Ingersoll XPV-3.
1531 ft. Ingersoll XPV-3.
1166 ft. Ingersoll XPVR-3.
823 ft. Ingersoll XPVR-3.
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1—Ing.-Rand 12x10, belt drive.
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BUCKETS
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1—Moore Speed Crane, 40-ft. boom.
1—Northwest 105 with 50-ft. boom.
1—Keystone No. 4 comb. shovel & crane.

TRACTOR SPECIALS

26—5-ton Holt Caterpillar Tractors 90% new.
1—2-ton Caterpillar Tractor.
3—Fordson Tractors, one with Shovel and one with Crane attach.

1—Page 75-ft. boom, 2½-yd. bucket, Skimmer attach. for P&H 206.
1—Byers Bearcat, 28-ft. boom.
1—Erie "B" high lift Shovel.

PUMPS
12—Centrifugal 3-4-5-6-8 and 15-in.
8—Diaph. 3 & 4 in., sgle. and dble.
1—Goulds triplex, 2½x4.
7—Barnes plunger, 3 & 4-in. suction.
3—Am. submerged cent. 8x6 and 10x8.

HOISTS AND DERRICKS
2—Novo 8/D 5 H.P. gas.
1—Ldg. 3/D 60 H.P. gas.
1—Mundy 3/D 8¼x10.
1—Ldg. D/D 15 H.P., gas.
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1—Set American stiffleg irons.
1—Set National stiffleg irons.
1—Sasgen stiffleg 3-ton, 50-ft. boom.
3—Steel Stiffleg, cap. 75 tons, 100-ft.
1—Steel Stiffleg, cap. 25 tons, 100-ft.

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10,000 ft. 24-in. ga. Portable Track.
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2—Koehring pavers, 27-S and 21E.
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4—Rollers, 4, 5 and 10 ton Tandem 3 wheel.
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3—24-in. ga. Locomotives, Plymouth and Milwaukee.

BOILERS
8—Vert. from 15 to 40 H.P.
10—75-hp. Loco. Type.

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1—Milwaukee 1-yd. A/C motor.

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2—Blaw-Knox ¾ yd. Buckets, with dig. teeth.
2—Haiss ¾ yd. "Contractor" type clamshells.
1—Owens ¾-yd. "Digging Bucket" with teeth.
1—Owens 1 yd. Digging type bucket with teeth.
1—Haiss ¾ yd. "Hipower" Dig. Bkt., rented out only 1 mo., same as new, grtd. like new, teeth.
1—Blaw-Knox 1-yd. "Lever-Arm" Clamshell bkt.
1—Haiss 1 yd. "Contractor" type clamshell bkt.
1—Hayward 1½-yd. "Class E" Clamshell Bucket.
1—Haiss 2½-yd. Digging or dredging Bucket.

FACTORY REBUILT TRUCK LOADER

1—Haiss Model 26 Creeper Path Digging Truck Loader equipped with 37-hp. Waukesha Engine.

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1—4-yd. **Marion Dipper Dredge,** with Steel A-Frame and Steel Boom. Machinery all in fine condition.
1—2½-yd. **Marion Dipper Dredge** with 60-ft. Steel Boom. Two Dump Scows.
1—**Steel Steam Tug** with compound engine.
1—**Steel Tug** with 175 hp. Semi-Diesel.
1—**Bucyrus** 65 Steam **Railroad Shovel.**
1—**Bucyrus-Erie Steam Shovel,** 41-B. Shop No. 9723, with 1¼ Bucket, on Caterpillars. Only used about 4 months. In good condition.
1—¾-yd. **Erie Steam Shovel,** Type B. Shop No. 1044 on traction wheels, A.S.M.E. Boiler.
1—⅝-yd. **Marion Steam Shovel,** Model 28. Shop No. 3384 on traction wheels.
1—12-in. **Centrifugal Morris Manganese Dredging Pump** with extra manganese shell, side plate, impeller, thrust shaft, cutter and cutter shaft, two round spuds, stone box and hull pipe. A-frame and gantry fittings. Motor, belt or Diesel drive. Good condition.
5—**Wooden Stiff Leg Derricks** with steel bull wheels, and masts 14x14 in. and 15½x16 in., booms 14x14 in., stiff legs 12x12 in., sills 12x12 in. All with fittings and sheaves. At low prices.
1—**National** three drum **Hoisting Engine,** steam.
1—**Mundy,** two cylinder, two drum, link motion, **Drag Bucket Engine,** size 7¼x10 in., steam.
1—**American** steam, double cyl., double drum, **Hoisting Engine,** size 7x10 in. with boiler.
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1—**Municipal Eng. & Contg. Co. Cube Mixer,** capacity 33 ft., direct connected to 8x8½-in. vertical Steam Engine with boiler.
1—**Byers Gas Crane** on caterpillars, 40-ft. boom and ½-yd. clam shell bucket.
1—9½-D **Acme Portable Rock Crusher,** jaws 11x18 in., with 30-ton Portable Bin, and 21-ft. Folding Bucket Elevator No. 9¾. Also Screen and Dust Jacket.
1—**National** three drum **Hoist** with attached swinger and 60-hp. Buda Gas Engine. Only used three months.
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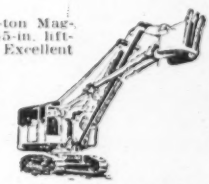

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GOOD DOCK ENGINEERS are not pig-headed. When an investment of hundreds of thousands is involved, real engineering genius dictates that the dock of superior strength, economy and endurance must be built—patent or no patent. ¶ The payment of royalties is no longer debatable in the mind of the wise builder when it means better docks at lower cost. The Federal Courts in repeated decisions have decreed that the Ferguson Patent on REINFORCED CONCRETE DOCKS must be respected. ¶ Keep your dock program abreast of modern engineering progress. Read this ever-increasing Ferguson REINFORCED CONCRETE DOCK ROLL-CALL. Then make the one ultimate and inevitable move of wisdom by adding your name to this list of leaders, now.

Detroit Edison Co.
Chicago & Northwestern Ry. Co.
Grasselli Chemical Company
City of Detroit
Union Carbide and Carbon Co.
Solvay Process Company
Pennsylvania Railroad Co.
Canton Co. of Baltimore
Winkworth Fuel & Supply Co.
Chicago, St. Paul, M. & O. Ry. Co.
Michigan Northern Power Co.
Lake Superior & Ishpeming R. R. Co.
The M. A. Hanna Co.
City of Cleveland
C. & B. Transit Co.
State of California
City of Houston, Texas
Kelley Island Lime & Transport Co.
Central West Coal Co.
Bethlehem Steel Co.
Standard Oil Co. of New Jersey
Sun Shipbuilding Co.
Virginia Shipbuilding Corporation
Peerless-Egyptian Cement Co.
City of Wyandotte, Mich.
A. J. Dupuis Co., Detroit, Mich.
Michigan Steel Castings Co.
Petoskey Portland Cement Co.
Wm. Cramp & Co.
Havana Docks Corporation
City of Norfolk
Detroit Iron and Steel Co.
The Cleveland Cliffs Iron Co.
City of St Petersburg
Gulf Refining Co.
D. & C. Navigation Co.
Anaconda Copper Co.
Houston Compress Co.
Stewart Sand Co. of Kansas City
Anderson-Clayton Co. of Houston
Mapes & Ferdon, Ltd.
Nicholson Terminal & Dock Co.
Staten Island Shipbuilding Co.
Imperial Tobacco Co.
Humble Oil Co.
Wisconsin Steel Co.
Edward W. Bissell Estate, Detroit, Mich.
Chester Shipbuilding & Dry Dock Co.
Baltimore Dry Dock & Steamship Co.
Sanford & Brooks Co. of Baltimore, Md.
Groton Iron Works Co., Groton, Conn.
Michigan Ammonia Works of Detroit
Consolidated G. & E. Co. of Baltimore

THE DOCK & TERMINAL ENGINEERING COMPANY

1248 WALNUT STREET — Consulting Engineers — GAYLORD W FEAGA, President — CLEVELAND, OHIO

Doors & Shutters, Steel Rolling
Kinnear Mfg. Co.

Drafting Machines
Universal Drafting Machine Co.

Drafting Room Furniture and Supplies
Hamilton Mfg. Co.
Weber Company, Inc., F.

Draglines
Byers Machine Company
Harnischfeger Corporation
Industrial Brownhoist Corp.
Link-Belt Co.
Marion Steam Shovel Co.
Monighan Mfg. Corp.
Northwest Engine Co.
Thew Shovel Company
Universal Crane Co.

Drain Pipe, Iron
Asphalto-Concreto Corp.

Drawing Materials
Hamilton Mfg. Co.
Keuffel & Esser Co.

Drawing Tables
(See Tables and Boards, Drawing)

Dredges
Bay City Dredge Works
Ellicott Machine Corp.
Hayward Co.
Marion Steam Shovel Co.
Norbom Engineering Co.
Osgood Company

Dredges, Dipper
Ellicott Machine Corp.
Harnischfeger Corp.
Link-Belt Co.
Osgood Company

Dredges, Hydraulic
Ellicott Machine Corp.
Marion Steam Shovel Co.
Morris Machine Works

Drills, Blast Hole
Gardner-Denver Company

Drills, Bore
Mott Core Drilling Co.

Drills, Core
Gardner-Denver Company
Giles Drilling Company
Ingersoll-Rand Co.
Keystone Driller Co.
McKiernan-Terry Corp.
Morris Machine Works
Mott Core Drilling Co.
Sprague & Henwood, Inc.
Sullivan Machinery Co.

Drills, Rock
Chicago Pneumatic Tool Company
Ingersoll-Rand Co.
Sullivan Machinery Co.

Drums, Counterweight
Hayward Co.

Drums, Holding
Blaw-Knox Co.
Hayward Co.

Dryers
Bartlett & Snow Co., C. O.
Blaw-Knox Co.
Vulcan Iron Wks. of Pa.

Electric Plants
Kohler Company

Elevators, Bucket
Bartlett & Snow Co., C. O.
Hauss Mfg. Co., Geo.
Hendrick Mfg. Co.
Lakewood Engrg. Co.
Link-Belt Co.
Ohio Locomotive Crane Co.

Elevators, Contractors' Material
Barber-Greene Co.
Dravo Equipment Co.
Insley Manufacturing Co.
Ransome Conc. Mchry. Co.
Thomas Elevator Co.

Elevators, Dragline
Northwest Eng'r'g Co.

Engineers
(See also Directory of Engineers)
Dock & Terminal Engrg. Co.
MacArthur Conc. Pile Corp.
Raymond Concrete Pile Co.
Spencer, White & Prentis, Inc.
Terry & Tench Co., Inc.

Engineers and Draftmen's Instruments and Supplies
Beckmann Company, L.
Chesterman & Co., Ltd.
Gurley, W. & L. E.
Hamilton Mfg. Co.
Kern Company
Keuffel & Esser Co.
Lufkin Rule Co.
Weber Company, Inc., F.

Engineers, Roofing
Amer. Cement Tile Mfg. Co.

Engines, *Diesel
Chicago Pneumatic Tool Company

Engines, Gas, Gasoline, Oil
Allis-Chalmers Mfg. Co.
Chicago Pneumatic Tool Company
Climax Engineering Company
Ingersoll-Rand Co.
Le Roi Company
Novo Engine Co.
Sterling Engine Co.

Engines, High Duty Water Works
Morris Machine Works
Sterling Engine Co.

Engines, Portable
Climax Engineering Company
Le Roi Company

Excavators
Hauss Mfg. Co., Geo.

Excavators, Bucket Type
Hauss Mfg. Co., Geo.

Excavators, Cableway
Sauerman Bros.

Excavators, Ditch & Trench
Barber-Greene Co.
Bay City Dredge Works
Buckeye Tr. Ditcher Co.
Byers Machine Co.
Harnischfeger Corporation
Keystone Driller Co.
Link-Belt Co.
Marion Steam Shovel Co.
Monighan Mfg. Corp.
Moore Trench Mach. Co.
Northwest Engrg. Co.
Osgood Company
Parsons Co.
Thew Shovel Company

Excavators, Drag-Line
Bay City Dredge Works
Blaw-Knox Company
Buckeye Traction Ditcher Co.
Byers Machine Co.
Harnischfeger Corporation
Hayward Co.
Koehring Co.
Link-Belt Co.
Marion Steam Shovel Co.
Monighan Mfg. Corp.
Northwest Engrg. Co.
Osgood Company
Sauerman Bros.
Thew Shovel Company

Expanded Metal
Ryerson & Son, Inc.

Expansion Bolts
National Lead Company

Piles, Steel
Carnegie Steel Co.

Filters, Water, Municipal & Industrial
Amer. Water Softener Co.
Leopold & Co., F. B.
Metropolitan Paving Brick Co.
Roberts Filter Mfg. Co.
Scaife & Sons Co., Wm. B.

Fireproofing Material and Construction
Kinnear Mfg. Co.
Metropolitan Paving Brick Co.

Floor Hardener, Concrete
(See Concrete Floor Hardener)

Flooring, Fireproof
Blaw-Knox Company
Dravo-Doyle Company
Hendrick Mfg. Co.
Tri-Lok Company

Floors, Asphalt Blocks
Standard Oil Co. of N. Y.

Floors, Asphalt Mastic
Standard Oil Co. of N. Y.

Floors, Composite Wood
Carter Bloxonend Flooring Company

Floors, Wood Block
Barrett Company
Jennison-Wright Co.
Republic Creosoting Co.
Southern Wood Preserving Co.

Flumes, Iron and Steel
American Rolling Mill Co.
Blaw-Knox Co.

Forgings
Bethlehem Steel Co.

Form Clamps
Universal Form Clamp Co.
Wedgit Tie Co., Inc.

Form Tightening
Marion Malleable Ir. Wks.
Wedgit Tie Co., Inc.

Forms—Culvert, Road, Sewer, Tunnel, Etc.
Blaw-Knox Co.
The Foote Company
Lakewood Engrg. Co.

Forms, Curb and Gutter
Blaw-Knox Co.
Lakewood Engrg. Co.

Formgraders
Ted Carr Company

Forms for Walls, Building Construction, Etc.
Blaw-Knox Co.

Foundations
MacArthur Con. Pile Corp.
Raymond Concrete Pile Co.
Simplex Conc. Pile Assn.
Spencer, White & Prentis, Inc.

Frogs and Switches, Railway
Bethlehem Steel Co.
Ramapo Ajax Corp.

Garbage Disposal Apparatus
Bartlett & Snow Co., C. O.

Gates, Clam Shell
Hauss Mfg. Co., Geo.

Gates, Flood
Newport News Shipbuilding & Drydock Co.

Gates, Sluice and Valve
Coldwell Wilcox Co.
Columbian Iron Works

Gauges, Loss of Head
Simplex Valve & Meter Co.

Gauges, Rate of Flow
Simplex Valve & Meter Co.

Gauges, Recording Pressure and Vacuum
Bristol Co.

Gauges, Water Level
Bristol Co.

Gears
Earle Gear & Mach. Co.
Hauss Mfg. Co., Geo.
Link-Belt Co.

Gears, Worm Reduction
Earle Gear & Mch. Co.
DeLaval Steam Turbine Co.

Generators, Electric
Allis-Chalmers Mfg. Co.

Governors, Waterwheel
Woodward Governor Co.

Graders, Elevating
Adams Company, J. D.

Graders, Road
Adams Company, J. D.
Galion Allsteel Body Co.
Good Roads Machinery Co.
Hauss Mfg. Co., Geo.
Thew Shovel Company

Graphite
Dixon Crucible Company, Joseph

Gratings, Flooring
Bates Steel Corp., Walter
Blaw-Knox Co.
Dravo-Doyle Company
Hendrick Mfg. Co.
Tri-Lok Company

Gratings, Safety
Bates Steel Corp., Walter
Blaw-Knox Co.
Dravo-Doyle Company
Tri-Lok Company

Gravel-Washing Plants
Link-Belt Co.
Sauerman Bros.

Grills
Dravo-Doyle Company
Link-Belt Co.
Tri-Lok Company

Grouting
Amer. Asphalt Grout'g Co.
Dravo Contracting Co.

Guard Rails, Highway
Laughlin Co., Thos.

Gunite Construction
Cement-Gun Co., Inc.
Cement-Gun Constr. Co.
Gunite Construction Co.
Rust Engr. Co.

Hammers, Pneumatic
(See Tools, Pneumatic)

Hammers, Steam, Pile
(See Pile Hammers, Steam)

Heaters, Concrete
Littleford Bros.

Heaters, Tar & Asphalt
Connery & Company
Littleford Bros.

Heaters, Tool
Littleford Bros.

Hoists, Caisson
Thomas Elevator Co.

Hoists, Concrete, Tower
Insley Manufacturing Co.
Ransome Conc. Mchry. Co.

Hoists, Contractors'—Electric
Allis-Chalmers Mfg. Co.
Bay City Shovels
Byers Machine Co.
Dobbie Fdry. & Mach. Co.
McKiernan-Terry Corp.
Monighan Mfg. Corp.
Nat'l Hoisting Engine Div.
Thomas Elevator Co.
Vulcan Iron Wks. of Pa.

Hoists, Contractors'—Gasoline
Harnischfeger Corporation
Novo Engine Co.
Thomas Elevator Co.
Vulcan Iron Wks. of Pa.

Hoists, Contractors' Steam
Allis-Chalmers Mfg. Co.
Byers Machine Co.
Ingersoll-Rand Co.
McKiernan-Terry Corp.
Mundy Hoisting Engine Co.
National Hoisting Eng. Co.
Vulcan Iron Wks. of Pa.

Hoists, Contractors Tower
Dravo Equipment Co.

Hoists, Electric
Harnischfeger Corp.
Novo Engine Company

Hoists, Gasoline
Mundy Hoisting Engine Co.

Hoists, Gates
Newport News Shipbuilding & Drydock Co.

Hoists, Hand
Harnischfeger Corp.

Hoists, Material Tower
Dravo Equipment Co.
Lakewood Engrg. Co.

Hoists, Pneumatic
Chicago Pneumatic Tool Company
Gardner-Denver Company
Ingersoll-Rand Co.
Sullivan Machine Co.

Hoists, Skip
Bartlett & Snow Co., C. O.
Link-Belt Co.

Hoists, Steam, Air, Water
Chicago Pneumatic Tool
McKiernan-Terry Corp.
Nat'l Hoisting Engine Div.

Hoppers, Concrete
Insley Mfg. Co.
Lakewood Engrg. Co.
Ransome Conc. Mchry. Co.

Hoppers, Steel
Blaw-Knox Co.

Hose, Steam, Air, Water
Chicago Pneumatic Tool Company
Gardner-Denver Company

Hydrants
Columbian Iron Works
Ludlow Valve Mfg. Co.
Michigan Valve & Fdry. Co.
Wood & Co., R. D.

Hydraulic Giants
Taylor Forge & Pipe Works

Hydrotite
Hydraulic Developm't Co.

Instruments, Surveying
Berger & Sons, C. L.
Brandis & Son
Buff & Buff Mfg. Co.
Gurley, W. & L. E.
Kern Company
Keuffel & Esser Co.
Weber Company, Inc., F.

Interlocking Steel
Spencer, White & Prentis

Inundators For Constant Concrete
Blaw-Knox Co.

Joint, Expansion Paving
Barrett Company
Carey Co., Philip

Joints, Filler Paving
Barrett Company
Standard Oil Co., of N. Y.

Joints, Flexible Pipe
Central Foundry Co.

Kettles, Tar & Asphalt
Connery & Company
Littleford Bros.

Kilns, Rotary and Vertical
Vulcan Iron Wks. of Pa.

Ladder Steps, Steel
Blaw-Knox Company
Hendrick Mfg. Co.

Lath, Expanded Metal
American Rolling Mill Co.
Ryerson & Son, Inc.

Lettering Guides
Keuffel & Esser Co.

Leadite
Leadite Co. Inc.

Lead Pencils
Dixon Crucible Company, Joseph

Lights, Contractor
Kohler Company

Loaders, Car & Wagon
Barber-Greene Co.
Hauss Mfg. Co., Geo.
Link-Belt Co.

Loaders, Portable
Hauss Mfg. Co., Geo.

Locomotives, Compressed Air
Porter Co., H. K.

Locomotives, Electric
Cincinnati Car Corp.
Mancha Storage Battery Locomotive Co.
Porter Company, H. K.
Vulcan Iron Wks. of Pa.

Locomotives, Fireless Steam
Porter Co., H. K.
Vulcan Iron Wks. of Pa.

Locomotives, Gasoline
Porter Company, H. K.
Whitcomb Company, Geo. D.

Locomotives, Oil Electric
Whitcomb Company, Geo. D.

Locomotives, Steam
Koppel Indust. Car & Equip. Co.
Porter Co., H. K.
Vulcan Iron Wks. of Pa.

Locomotives, Storage Battery
Mancha Storage Battery Locomotive Co.
Vulcan Iron Wks. of Pa.

Long Distance Systems
Bristol Co.

Lubricants
Dixon Crucible Company, Joseph

Machinery, Paver
Chain-Belt Co.

Manhole Covers
Central Foundry Co.

Manometers
Simplex Valve & Meter Co.

Metals, Perforated
Hendrick Mfg. Co.

Meters, Boiler Feed Water
Builders Iron Fdy.

Meters, Current
Gurley, W. & L. E.

Meters, Gas and Steam
Builders Iron Fdy.

Meters, Water and Oil
Builders Iron Fdy.
Neptune Meter Co.
Simplex Valve & Meter Co.

Mixers, Concrete
Cement Gun Co., Inc.
The Foote Company
Koehring Mfg. Co.
Lakewood Engrg. Co.
Ransome Conc. Mchry. Co.

Mixers, Grout
Ransome Conc. Mchry. Co.
Union Iron Works

Mixers, Mortar
Ransome Conc. Mchry. Co.

Mixers, Paving
The Foote Company
Koehring Mfg. Co.
Ransome Conc. Mchry. Co.

Mixers, Pneumatic
Ransome Conc. Mchry. Co.

Motors, Electric
Allis-Chalmers Mfg. Co.

Paints, Graphite
Dixon Crucible Company, Joseph

Paints, Metal Protective
Asphalt Products Co.
Barrett Company
Carey Co., Philip
Dixon Crucible Company, Joseph
McEverlast, Inc.
National Lead Company
Truscon Laboratories

Paints, Waterproofing
Asphalt Products Co.

Pavement Breakers
Chicago Pneumatic Tool Company
Gardner-Denver Company
Ingersoll-Rand Co.

Paving, Bricks
National Paving Brick Ass'n

Paving Asphalt
Carey Company, Philip
Standard Oil Co. of N. Y.

Paving, Asphalt Mastic
Standard Oil Co. of N. Y.

Paving Blocks, Asphalt
Hastings Pavement Co.

Paving Blocks, Creosoted Wood
(See Creosoted Blocks, Timber, Poles, Cross Arms, Lumber, etc.)

Paving, Bricks
Metropolitan Paving Brick

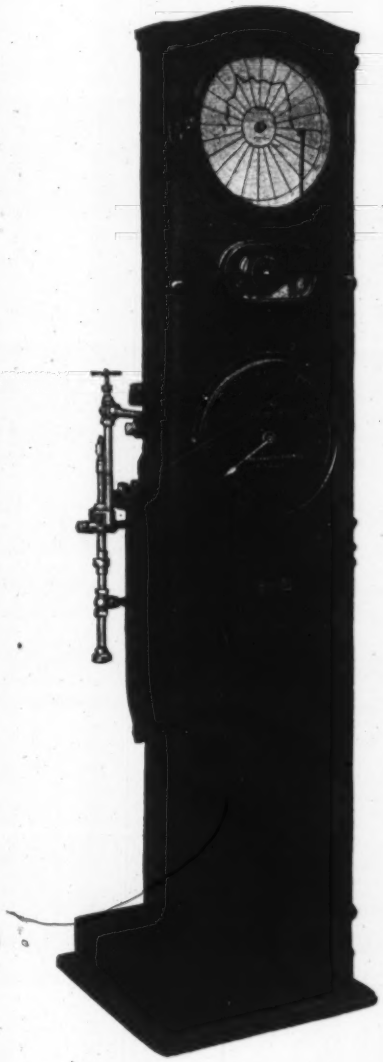
Paving, Cold Patching
Standard Oil Co., of N. Y.

Penstocks
Blaw-Knox Co.
Chicago Bridge & Iron Wks.
Newport News Shipbuilding & Drydock Co.
Petroleum Iron Wks.
Pitts.-Des Moines Steel Co.
Taylor Forge & Pipe Wks.

Piers
Dock & Terminal Engrg. Co.

Pile-Drivers
Browning Crane Co.
Harnischfeger Corporation

Venturi
Register–Indicator–Recorder



Venturi-Type M
Register—Indicator—Recorder

The Venturi Meter is accepted by Engineers as the most dependable and accurate means of measuring flow through pipe lines.

The Type M Register-Indicator-Recorder has done its full share in bringing about such confidence in the Venturi.

A study of the Instrument soon shows why this has been true.

1. The Type M is large in size, making frail delicate parts unnecessary.
2. The Type M is powerful, due to ample size of mercury wells and floats.
3. The Type M is accurate under all sorts of conditions because the Venturi principle is theoretically correct and the Instrument is designed and built with accuracy as the chief aim.

These reasons, and others, explain why Venturi Meters are chosen where dependable, accurate records of flow conditions are essential whether it be in laboratory test work or in furnishing pumpage and consumption records for a complete water works system.

VENTURI

BUILDERS IRON FOUNDRY

"Builders of the Venturi since 1891"

9 Codding Street Providence, R. I.

Industrial Brownhoist
Link Belt Co.
McKiernan Terry Corp.
Union Iron Works
Vulcan Iron Wks. Chicago

Pile Extractors
McKiernan Terry Corp.
Union Iron Works
Vulcan Iron Wks. Chicago

Pile Hammers, Steam
McKiernan Terry Corp.
Union Iron Works
Vulcan Iron Wks., Chicago

Piles, Concrete
MacArthur Con. Pile Corp.
Raymond Concrete Pile Co
Simplex Conc. Pile Assn.
Spencer, White & Prentis, Inc.

Piles, Creosoted, Wood
American Creosoting Co.
Jennison-Wright Co.
Southern Wood Preserving

Piling, Interlocking Steel
Bethlehem Steel Co.

Pipe, Bends
East Jersey Pipe Co.

Pipe, Cast Iron
American Cast Iron Pipe Co.
Central Foundry Co.
Fox & Co., John
McWane Cast Iron Pipe Co.
Republic Iron & Steel Co.
Wood & Co., R. D.

Pipe, Cement-Lined
Cement Lined Pipe Co.

Pipe, Concrete
American Hume Concrete Pipe Co.
Independent Conc. Pipe Co.

Pipe, Corrugated
Canton Culvert & Silo Co.

Pipe Covering, Asbestos
Carey Co., Philip

Pipe Covering, Wood
Michigan Pipe Co.
Standard Wood Pipe Co.
Wyckoff & Son Co., A.

Pipe, Cutters
Ellis & Ford Mfg. Co.

Pipe Fittings
Builders Iron Fdy.
Central Foundry Co.

Pipe Flanges, Forged Steel
Taylor Forge & Pipe Wks.

Pipe, Forge Welded
Taylor Forge & Pipe Wks.

Pipe, Fusion Welded
Petroleum Iron Works Co.

Pipe, Joint Compounds
Hydraulic Development Co.
Leadite Co., Inc.
Presstite Engrg. Company

Pipe Jointing Material
Presstite Engineering Co.

Pipe, Lock Bar
East Jersey Pipe Co.

Pipe, Reinforced Concrete
American Hume Concrete Pipe Co.
Core Joint Concrete Pipe Co.
Independent Conc. Pipe Co.

Pipe, Riveted Steel
Blaw-Knox Co.
Chicago Bridge & Iron Works
East Jersey Pipe Co.
Petroleum Iron Works Co.
Smith Corporation, A. O.

Pipe, Sewer
Core Joint Concrete Pipe Co.
Laclede Christy Clay Prod. Co.

Pipe Shoes
Marion Malleable Ir. Wks.

Pipe, Spiral
Blaw-Knox Co.
Taylor Forge & Pipe Wks.

Pipe, Spiral Riveted
Abendroth & Root Mfg. Co.

Pipe, Welded Steel
Smith Corporation, A. O.

Pipe, Wood
Michigan Pipe Co.
Pacific Tank & Pipe Co.
Standard Wood Pipe Co.
Wyckoff & Son Co., A.

Pipe, Wrought Iron
Reading Iron Co.
Wrought Iron Research Ass'n

Poles, Steel Structural
Blaw-Knox Co.

Power Units, Gasoline
Climax Engineering Company
Le Roi Company

Pressed Steel Products
Blaw-Knox Co.

Pumps, Air-Lift
Chicago Pneumatic Tool Company
Ingersoll-Rand Co.
Sullivan Machinery Co.

Pumps, Boiler-Feed, Steam
Buffalo Steam Pump Co.
Cameron Steam Pump Works, A. S. (Ingersoll Rand Co.)
Ingersoll-Rand Co. (Cameron Steam Pump Wks. A. S.)
Kingsford Fdry & Machine Works
Sullivan Machinery Co.

Pumps, Centrifugal
Nash Engineering Co.

Pumps, Centrifugal and Multi-Stage High Lift
American Well Works
Buffalo Steam Pump Co.
Cameron Steam Pump Works, A. S. (Ingersoll Rand Co.)
De Laval Steam Turbine Co.
Erie Pump & Engine Co.
Gardner-Denver Company
Ingersoll-Rand Co. (Cameron Steam Pump Wks. A. S.)
Keystone Driller Co.
Kingsford Fdry & Machine Works
Lawrence Pump & Eng. Co.
Layne & Bowler, Inc.
LeCourtenay Co.
Manistee Iron Works
Morris Machine Works
Novo Engine Co.

Pumps, Contractors
Cameron Steam Pump Works, A. S. (Ingersoll Rand Co.)
Gardner-Denver Company
Ingersoll-Rand Co. (Cameron Steam Pump Wks. A. S.)
Lawrence Pump & Eng. Co.
Nash Engineering Co.
Novo Engine Co.
Pulsometer Steam Pump Co.

Pumps, Deep Well
American Well Works
Layne & Bowler, Inc.
Manistee Iron Works
Novo Engine Co.

Pumps, Diaphragm
Novo Engine Company

Pumps, Dredging and Sand
Ellicott Machine Corp.
Lawrence Pump & Eng. Co.
Marion Steam Shovel Co.
Morris Machine Works
Norbom Engineering Co.

Pumps, Power
American Well Works
Buffalo Steam Pump Co.
Layne & Bowler, Inc.
Lecourtenay Co.
Sterling Engine Co.

Pumps, Sewage
Buffalo Steam Pump Co.
Kingsford Fdry & Machine Works
Lawrence Pump & Eng. Co.
Nash Engineering Co.
Pacific Flush Tank Co.

Pumps, Underwriters Centrifugal
Allis-Chalmers Mfg. Co.
American Well Works
Buffalo Steam Pump Co.
Earle Gear & Machine Co.
Sterling Engine Co.

Pumps, Water Intake
Chicago Pneumatic Tool Company

Pyrometers
Bristol Co.

Rail and Rail Joints, Fastening and Specialties
Bethlehem Steel Co.

Rails, Relaying
(See Searchlight)

Railroad Ditchers
Harnischfeger Corporation
Marion Steam Shovel Co.

Rakes, Rack
Newport News Shipbuilding & Drydock Co.

Recorders, Motion and Time
Bristol Co.

Recorders, Water Stage
Bristol Co.
Gurley, W. & L. E.

Refractories
La Clede Christy Clay Prod. Co.

Reinforcing, Bar Coupling
Marion Malleable Ir. Wks.

Reinforcing, Concrete
(See Concrete Reinforcement)

Reinforcing Metal for Concrete Work
Ryerson & Son, Inc.

Riveting Machines
Chicago Pneumatic Tool Company

Road Finishers, Concrete
Lakewood Engrg. Co.

Road Oils and Preservatives
Barber Asphalt Company
Barrett Company
Solvay Sales Corporation
Standard Oil Co. of N. Y.

Road Rollers, Gasoline and Steam
Buffalo-Springfield Roller
Galion Allsteel Body Co.
Good Roads Machinery Co.
Huber Mfg. Company

Rolls, Crushing
Allis-Chalmers Mfg. Co.

Roofing Concrete
Amer. Cement Tile Mfg. Co.

Roofing, Metal
Ryerson & Son, Joseph T.

Roofing, Prepared
Barrett Company
Carey Co., Philip

Roofing, Tile
Amer. Cement Tile Mfg. Co.

Rope, Wire-Transmission, Hoisting and Haulage
Leschen & Sons Rope Co.
Roebling's Sons Co., John A.

Sash Operating Apparatus
Lord & Burnham Co.

Sash, Steel, Window
(See Window Sash)
Knickerbocker Co.

Scrapers, Dragline
Sauerman Bros.

Scrapers, Scarifiers, Plows
Adams & Co., J. D.
Galion Allsteel Body Co.
Western Wheeled Scraper Co.

Screens, Revolving
Haiss Mfg. Co., Geo.
Smith Engineering Works

Screens, Sand, Gravel and Coal
Haiss Mfg. Co., Geo.
Hendrick Mfg. Co.
Link Belt Co.

Second Hand Equipment
(See Searchlight Section)

Sewage Disposal Apparatus
Link Belt Co.
Metropolitan Paving Brick
Nash Engineering Co.
Pacific Flush Tank Co.

Sewer, Pipe Joint Compounds
Presstite Engrg. Company

Sewer, Segment Blocks
Laclede Christy Clay Prod. Co.

Sharpening Machines, Drill Bit
Gardner-Denver Company
Ingersoll-Rand Co.
Sullivan Machinery Co.

Sheaves
Haiss Mfg. Co., Geo.
Mundy Hoisting Engine Co.

Sheets, Iron & Steel
Bethlehem Steel Co.
Ryerson & Son, Inc.

Sheets, Roofing and Siding
American Rolling Mill Co.
Ryerson & Son, Inc.

Shores, Adjustable
Universal Form Clamp Co.

Shovels and Pile Driver Attachments
Browning Crane Co.

Shovels, Crawling Tractor
Byers Machine Company
Ohio Power Shovel Company
Thew Shovel Company

Shovels, Creeper
Harnischfeger Corp.

Shovels, Diesel
Harnischfeger Corporation
Northwest Engine Co.
Ohio Power Shovel Co.

Shovels, Electric
Byers Machine Company
Harnischfeger Corporation
Keystone Driller Company
Link-Belt Co.
Marion Steam Shovel Co.
Northwest Engine Co.
Ohio Power Shovel Co.
Thew Shovel Company

Shovels, Gasoline
Byers Machine Company
Harnischfeger Corporation
Industrial Brownhoist
Koehring Mfg. Co.
Link-Belt Co.
Marion Steam Shovel Co.
Northwest Engine Co.
Ohio Power Shovel Company
Thew Shovel Company
Universal Crane Co.

Shovels, Power
Universal Crane Co.

Shovels, Skimmer
Byers Mach. Co.

Shovels, Steam
Byers Machine Company
Harnischfeger Corporation
Industrial Brownhoist Corp.
Keystone Driller Co.
Marion Steam Shovel Co.
Northwest Engine Co.
Osgood Company
Thew Shovel Company

Shovels, Trencher
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Insley Manufacturing Co.
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Amer. Cement Tile Mfg. Co.

Slabs, Concrete Roofing
American Cement Tile Manufacturing Co.

Snow Loaders
Haiss Mfg. Co., Geo.

Snow Plows
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Littleford Bros.

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Chicago Bridge & Ir. Wks.
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Blaw-Knox Company

Steel
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Republic Iron & Steel Co.
Ryerson & Son, Joseph T.

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Blaw-Knox Co.
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Williams Co., G. H.

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Eastern Bridge & Structural Co.
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Phoenix Bridge Co.
Pitts.-Des Moines Steel Co.
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Shoemaker Bridge Co.
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Virginia Bridge & Iron Co.
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Hamilton Mfg. Co.
Weber Company, Inc., F.

Tackle Blocks
Patterson Co., W. W.

Tank Lugs
Marion Malleable Iron Works

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Chicago Pneumatic Tool Company
East Jersey Pipe Co.

Tanks, Elevated Steel
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Cole Mfg. Co., R. D.
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Pitts.-Des Moines Steel Co.

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Petroleum Iron Works
Pitts.-Des Moines Steel Co.
Riter-Conley Co.

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Littleford Bros.

Tanks & Vats, Wood
Pacific Tank & Pipe

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Hamilton Mfg. Co.
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Lufkin Rule Co.
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Tar
Barrett Company

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American Creosoting Co.
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Truscon Laboratories

Tile, Concrete Building
Amer. Cement Tile Mfg. Co.

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Amer. Cement Tile Mfg. Co.

Tile, Roof Cement
Amer. Cement Tile Mfg. Co.

Tin Plate
Bethlehem Steel Co.

Tools, Electric
Chicago Pneumatic Tool Company

Tools, Pneumatic
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Torches, Gasoline, Blow
Williams Co., G. H.

Torches, Oil Burning
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Towers, Contractors Material
Dravo Equipment Co.

Towers, Radio
Blaw-Knox Co.

Towers, Transmission
Bates Steel Corp., Walter
Blaw-Knox Co.
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Towers, Tubular Steel
Dravo Equipment Co.
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Track, Industrial and Portable
Bethlehem Steel Co.
Koppel Industrial Car & Equipment Co.
Lakewood Engrg. Co.

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Buckeye Tr. Ditcher Co.

Tramways, Overhead
Harnischfeger Corporation

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Brandis & Son
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Gurley, W. & L. E.
Weber Company, Inc., F.

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Link Belt Co.

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Blaw-Knox Company
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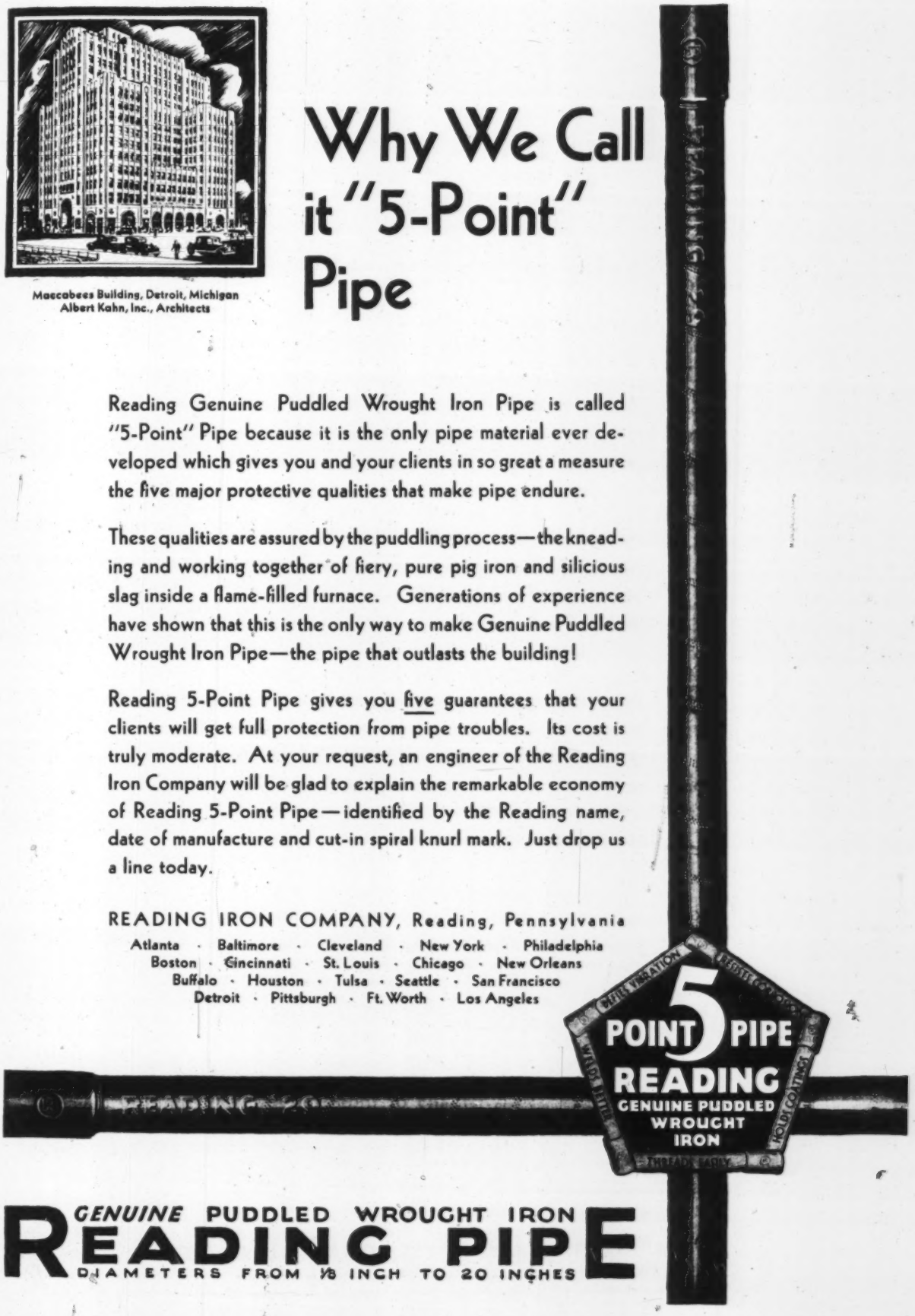

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Dobbie Fdry. & Mchry. Co

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(See Rope, Wire)

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(Circulation over 30,000 weekly)

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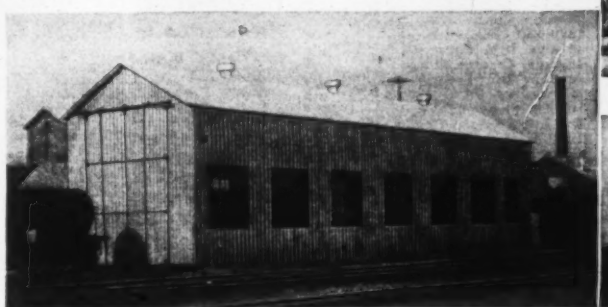

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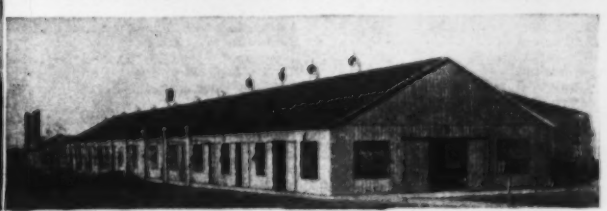

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ENGINEERING SERVICE DIRECTORY 114

THE names of manufacturers in every industry using Hyatt Roller Bearings read like a selection of red letter leaders. Consequently, Hyatt bearings are most widely used in road building equipment.

Unwavering satisfaction in a variety of applications . . . in pavers, mixers, excavators, shovels, locomotives, crushers, tractors, graders, sweepers, cars, pumps, scrapers and road rollers . . . has earned for Hyatt a record of bearing performance that is unparalleled in this industry.

Good Equipment and Good Bearings are Inseparable

Hyatt Roller Bearings are used in the following contractors' equipment: *Batch Box Cars*—Easton, Koppel, Lakewood. *Excavators & Power Shovels*—Bay City, Insley, Harnischfeger, Marion, Ohio. *Pavers, Mixers & Power Towers*—American, Archer, Besser, Blystone, Chain Belt, Ideal, Koehring, Lakewood, Lansing, Ransome, Republic. *Drag Lines, Scrapers & Ditchers*—Austin, Barber-Greene, Buckeye, Monighan. *Industrial Locomotives*—Atlas, Davenport, Lima, Milwaukee, Plymouth, Vulcan Whitcomb. *Truck Hoists*—Hydro, Miami. *Pumps*—Barnes, Deming, Domestic. *Sheave Blocks*—Clyde. *Graders*—Adams, Acme, American, Galion, Shaw-Enochs. *Rollers*—Acme, Ames, Buffalo-Springfield, Erie, Galion, Huber. *Crushers*—Iowa, Rogers, Wheeling. *Screens*—Cottrell. *Dump Wagons*—Euclid, Western. *Tar Wagons*—Littleford. *Trailers*—La Plant-Choate, Rogers. *Sand Hogs*—New Bedford. *Tractors*—Advance-Rumely, Allis-Chalmers, Baker, Bates, Caterpillar, Case, Cletrac, Deere, Eagle, Frick, Hart-Parr, Huber, Lauson, Minneapolis, Monarch, Rock Island, Twin City, Yuba. *Crawler Attachments*—Alwatrack, Athey, Bates, Creeper Wheel, Rigid-Rail, Trackson.

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Encased in lubricant tight housings, no foreign substances can enter to null their steady, smooth, frictionless performance.

Executives whose duty it is to conserve profits will recognize the wisdom of specifying Hyatt Roller Bearings.

HYATT ROLLER BEARING COMPANY

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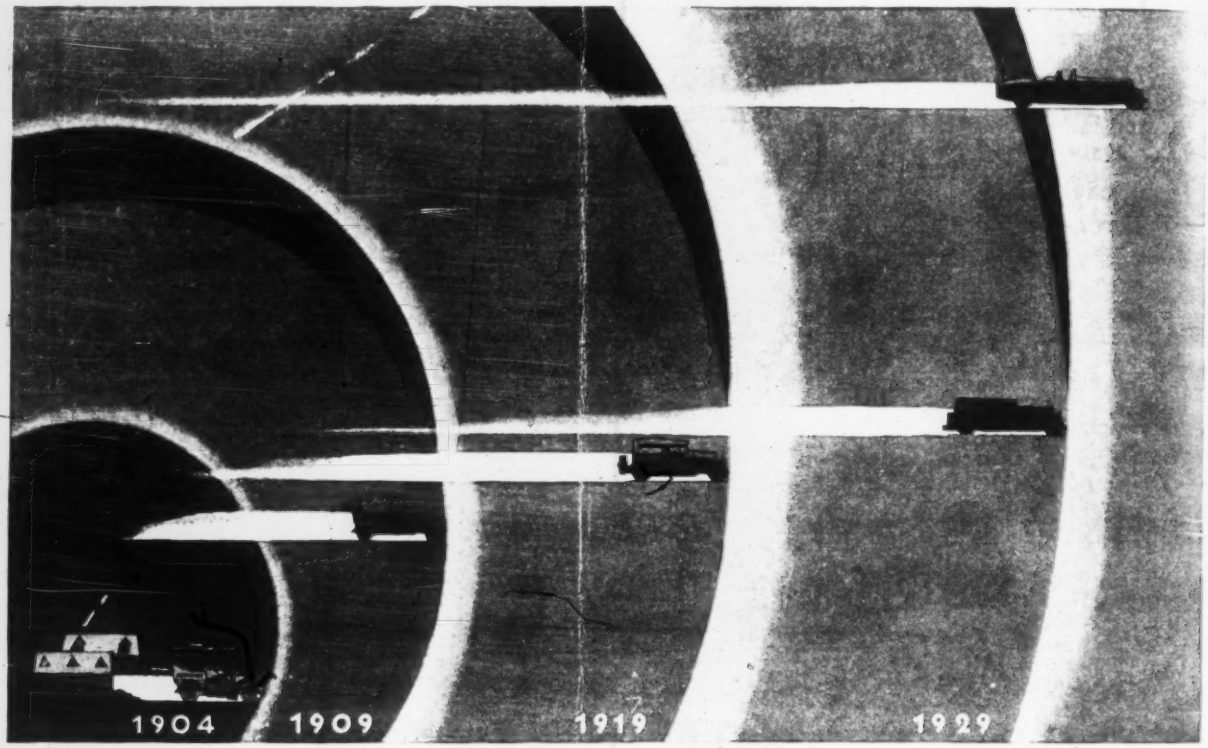
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

« Ever-lengthening Radii »



TEN years ago, the average day's run of the motor tourist was 110 miles. Today it is 234 miles. There are not a few purposeful pilots who do 500 miles in a single day's going. What a contrast with 1909—when our country consisted largely of people limited to a daily radius of 15 miles!

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But automobiles are increasing faster than pavements. More and wider roads—not just more and faster automobiles—are needed.

There need be no waiting—no burdensome financing—if your community adopts a Tarvia program. Twenty-five years of low-cost construction and economical first-class performance have proved Tarvia. It is the road enabling maximum economy in use of local materials—equal to every traffic requirement—long-lasting, skid-safe and smooth.

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Providence	Syracuse	Milwaukee
Baltimore	Toledo	Cincinnati
Lebanon	Youngstown	Rochester
		Bethlehem

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